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THE AMERICAN ECONOMIC SYSTEM

The
American Economic
System

by Frank D. Newbury

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THE AMERICAN ECONOMIC SYSTEM

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This book is dedicated to all students wherever they may be—in school, in business, or in organized labor—who desire deeper understanding of the powerful, dynamic, restless economic system which is our American heritage. With understanding there can be greater progress and more stability; without understanding there may be stagnation, decay, or even destruction of this system for which we are all responsible.

PREFACE

The primary purpose of this book is to provide material in convenient form for a comprehensive course covering the principles, institutions, structure, and operation of the American economic system—what it is and how it works, and why sometimes it does not work as well as it should. The material, it is hoped, will appeal to three groups of students: (1) third-or fourth-year students in professional schools and colleges; (2) students in more general college courses who are interested in an applied economics course; and (3) businessmen, college graduates in training with industry, and other students outside the colleges who are seriously interested in obtaining a working knowledge of the operations of our American economic system. A more ambitious objective is to give the serious student in college or in industry the ability to apply this understanding to practical situations and the ability to justify his opinions and conclusions by sound reasoning.

It may be impossible to attain this complete objective within the time limits of a single college semester and under the compulsions of a crowded curriculum. Notwithstanding these handicaps, it is hoped that most students can obtain a useful degree of understanding of the economic fundamentals underlying current problems. It is hoped that the close connection of economic principles with practical situations, that is stressed throughout the text, will make the study of economics interesting and possibly exciting—something that the study of orthodox principles alone has seldom succeeded in doing.

More now than ever, men and women in all walks of life—from the factory worker, the business executive, on up to the President of the United States—are called on to form their own judgments about involved political and business questions that require the application of economic principles. Better understanding of the principles, institutions, and the operation of our American system is, perhaps, the most effective bulwark we can erect against wrong and dangerous decisions in these important matters.

It is inevitable that with the addition of this new material in a single-semester course much of the old material of the traditional course must be discarded. The material that is omitted from this book lies almost wholly within the field of orthodox static theory. Less than one-fifth of the present book deals with static theory and with the theory of perfect competition and monopolistic competition. Only those parts of static theory are retained that are necessary for the understanding of the operation of the actual dynamic system, as discussed in later chapters. Notwithstanding this minimum use of static theory, the theory that has been included has been treated rigorously. No concession has been made to an easy presentation; difficulties have not been avoided.

Statistics and numerical examples and relationships have been used freely in the text with the purpose of giving the student some idea of the size of the quantities and forces involved and of actual cost and price relationships. In so far as possible, realistic data from industry are given. In economics, as in the physical sciences, effective understanding begins with a grasp of the size of things and of numerical relationships.

Some explanation of the nature and purpose of the review questions and problems that appear at the end of each chapter may be in order. These questions and problems are intended for assignment to single students or to teams of students for preparation outside the classroom and for later classroom discussion. Different teams may be assigned the same controversial question with instructions to take opposing sides. The questions may be used in many different ways, depending on the teaching methods, available time, and on the average experience and ability of the class.

The questions have been deliberately designed to emphasize the controversial nature of many economic situations and the wide differences in conclusions that can result from different assumptions that are characteristic of different group interests or of different ideologies. It may be necessary for the instructor to supply background information in some cases and to point out the different assumptions that are made by different interested groups. One purpose of the questions—time permitting—is to lead the student to do his own thinking and to reach his own conclusions.

If available time does not permit the teaching of the complete book, there are certain chapters and sections that are less necessary than others and that may be omitted without serious loss. If contraction of the course is necessary, the following omissions are suggested:

1. Chapters 4, 5, and 6 of Part Two. Chapter 3 (The Static State), although related to the following three chapters that are suggested for omission, should not be omitted because Chap. 3 is referred to throughout the book to compare the conditions and assumptions of the static state with those of the dynamic state.
2. Chapter 17. This chapter covers in a different way some of the same

material of Chap. 16. The accounting-statement approach used in Chap. 17 will be most helpful to students who are familiar with elementary accounting principles.

3. There are three rather technical sections of Chap. 14 (The Behavior of Money) that can be omitted without omitting essential principles. These are (*a*) Definitive Money in the United States (page 311); (*b*) Reserve Position of the Banking System (page 321); and (*c*) Effect of Government Debt on Money Supply (page 328).

4. Chapter 21 (Forecasting Business Activity). This chapter introduces no new principles; it is an application of the principles and behavior of the American system that are developed in the preceding chapters.

All of these possible omissions add up to about 20 per cent of the complete text. Any one or more of these four items may be omitted or retained, depending on the preferences of the instructor and the available time.

As with most textbooks, this book is the end-result of many drafts and of several experimental classroom trials and of seemingly endless revision. Two different drafts were tried out with different evening classes of businessmen with an average of some 10 years' practical experience. A later draft was used by one class of engineering school juniors at The Pennsylvania State College. These several trials resulted in considerable revision of the arrangement and content of the text, with improvement, it is hoped, in its teachability.

The text has had the benefit of criticisms and suggestions from a number of teaching economists. Dr. Reuben E. Slesinger, of the Economics Department of the University of Pittsburgh, read all of the drafts, made numerous suggestions, and used the text in one of the classes of businessmen previously mentioned. Dr. N. Arnold Tolles and Dr. Robert H. Ferguson, both of the New York State School of Industrial and Labor Relations of Cornell University, read one of the drafts and made many valuable suggestions as to contents, arrangement, and teachability. Dr. George L. Leffler, of the Economics Department of The Pennsylvania State College, used the text in one of his classes and contributed valuable suggestions.

Professor C. E. Bullinger, Head of Industrial Engineering at The Pennsylvania State College, also read the manuscript in several editions and contributed generously from his broad teaching experience. These and many other friends in the teaching fraternity have given assistance and encouragement that has been most useful and that has been gratefully appreciated. Notwithstanding all of this help, the author has had the last word and is solely responsible for the conclusions and opinions that appear in the book.

I wish to acknowledge especially my debt to Dean H. P. Hammond of the School of Engineering of The Pennsylvania State College, and appreciation of the help and encouragement I received from him throughout this project. His persistent encouragement has been an important factor in bringing this work up to the present stage of publication.

FRANK D. NEWBURY

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PART ONE. The American Economic System

1. THE NATURE OF THE ECONOMIC SYSTEM

In this first chapter we will learn something about the American economic system: its objectives, its institutions and principles, and the mechanism through which it operates. There will be an opportunity to consider the economic system as a complete organism and to observe the role that each of its major members plays.

What economics is, the field it covers, and the nature of the man-made system through which it does its appointed tasks, will become evident as we go along. At this point it is sufficient to start with a very broad definition. Economics pertains to the principles and practices that concern the satisfaction of man's needs. In its original meaning economics was severely limited in scope to the management of a household or of a private estate or income. The concept grew so that it now includes the entire field of the production and distribution of scarce goods and services; the management of a country's aggregate income and expenditure; and the management of the affairs of a community, of a nation, and of trade among nations.

If one could imagine a community of families in which each family unit was completely self-sufficient, in such a community economic organization would be unnecessary and the economic problems with which this book will deal would not arise. It is only when men join together in cooperative activities for production that include the division and specialization of labor and the general exchange of goods and services that the need for an elaborate economic system becomes apparent. Robinson Crusoe on his lonely island was faced with all the serious problems of satisfying his needs and desires, but obviously he was involved in none of the serious problems of production and distribution with which economics deals. A little thought will show that the difficult problems of economics, as we know them, begin when a community of people join together in the business of supplying each other's needs under some form of organized government. Then some kind of economic organization or system becomes a necessity. Some kind of system develops out of the daily needs of existence. Ways are discovered whereby, as the economist puts it, the incentives of private interest can be harnessed for the general good.

In order to exist at all, people must have food, shelter, and clothing—potatoes, houses, wool, and cotton; they desire a multitude of other less necessary things, and they need better and better tools to produce them. Robinson Crusoe had to provide all of these material things by his own hands. But people who cooperate for production can divide up the work according to their special aptitudes and skills. By this specialization of skills and division of labor, each worker can produce more, and the community is able to have more. There are obvious advantages in dividing up the work in this fashion, but cooperation immediately introduces some equally obvious problems. Who shall produce potatoes, and who shall produce houses; how can some workers continue to eat while they build houses or make better tools; and what does each worker get in return for his labor? These are a few of the basic questions of a cooperative society that economics attempts to explain.

The First Objective of an Economic System. So, when people live and work together in a cooperative society, they are forced to work out, by trial and error, some kind of economic system. And the first objective of an economic system is to make it possible for people to gain the great advantages of cooperative labor—of the division and specialization of labor—and to meet as nearly as possible the requirement that each worker in the cooperative effort act as if he were producing directly for himself and his family. A successful system, then, must meet these fundamental requirements as its first objective:

a. The system should induce people to work so that the group will have the goods and services that are needed and in increasing quantities;
b. It should lead to the production of the kinds and quantities of goods and services that the people want most; it should match production with needs;
c. It should make it possible for workers to do the kind of work they wish to do;
d. It should determine how the goods and services that are produced will be divided among the people.

In short, an economic system is the organization of society into a team that will work together to produce the goods and services that are needed. The first objective is that the system produces and produces abundantly.

As was mentioned before, Robinson Crusoe faced none of these problems of cooperative organization. The necessity for work was demonstrated by his own needs and by his obvious dependence on his own efforts. These problems arising from cooperative effort existed in a very mild form, if at all, in an isolated family or in the small farming communities of pioneer days. They have become more and more difficult and complicated as our country has changed from a nation of farmers, or dwellers in small villages in close touch with the land, who were all relatively poor, into a nation of relatively well-off wage earners in which the people are almost completely dependent on each other for everything they use.

The Increasing Complexity of the American Economic System. It will help us realize the vast changes that the economic system of the United States has undergone, and the consequent growth in complexity of economic problems, if the typical American of 1820 is contrasted with his descendant of today. A century and a quarter ago the typical American was a farmer who worked his own farm, who lived in a house built by himself or with the help of immediate neighbors, who wore, most of the time, homespun clothing.

In these earlier times the farmers, tradesmen, craftsmen of the community worked largely for themselves—not for others. Most of them produced at least a part of their own food, clothing, and shelter. Women's and children's clothing and men's rough work clothes were made in the home. Most men in the cities wore made-to-order boots or shoes, shirts, and suits produced in small shops, rather than factory-made, ready-to-wear clothing. Few people worked at full-time jobs for wages, and they were not greatly concerned if their money income stopped for a time. Annual money incomes were surprisingly small, but money did not measure total income. Money and money income were not nearly so important then as they are today. Most of real income, represented by food, clothing, and shelter, came directly from the land and from our typical American's own labor and the work of his household. It is a fair guess that in 1820 only 30 to 40 per cent of total production of goods and services in the nation was exchanged for money, even after excluding household labor performed by members of the family. Today, a corresponding figure would be around 80 per cent.

In those earlier times each small town or village could exchange goods only within a small circle because of the physical difficulties of transportation and communication. Buying "store goods" was an event. All manufactured goods were scarce, costly, used sparingly, and saved to be used again. Even little things that we waste thoughtlessly were carefully saved: pins and needles, paper and string. The ashes of a burned building were carefully raked over to save the handwrought nails and other small items of ironware.

Prices of home-grown produce were low, but prices of manufactured goods were amazingly high. West of the Allegheny Mountains a suit of "store clothes" cost as much as a farm. The freight on a ton of goods transported by wagon road for 100 miles was $32. Today the railroads haul a ton 100 miles for about $1—about 1 cent a ton-mile. Low-cost transportation and national markets are necessary conditions for modern factory mass production and economic well-being.[1]

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[1] THOMASON, CALVIN C., "Economic Problems and Cases," 9th ed., Rochester Institute of Technology, Rochester, N.Y., 1948.

The relation of high transportation costs to a low plane of living is brought out by an interesting comparison of transportation costs in modern Turkey and in the United States. A United States highway engineer in Turkey found that ox-driven carts, commonly used in Turkey, haul a quarter ton of freight 5 miles a day or a total of 1¼ "ton-miles." The driver gets $1.25 for a long day's work. So wages alone make the cost $1 a ton-mile. In contrast, the usual charge for truck hauls in the United States is less than 3 cents per ton-mile. This covers not only wages of the driver but all other direct and indirect costs and the owner's profit. The typical 10-hour truck haul carries 10 tons of freight 300 miles or 3,000 ton-miles. The driver's wages on a 10-hour haul amount to $16. So the direct wage cost is just over half a cent per ton-mile against $1 a ton-mile for ox-cart transport. High transportation costs require that each small community live by its own production.[2]

Contrasted with the relatively self-sufficient American citizen of 1820, the typical American of 1947 is an employed worker whose money income may be thirty to forty times as large in dollars as the money income of his ancestor of 1820 (which was less than $100 per capita in dollars of current value). But this large money income is his total income. If his employment stops for any length of time, his income stops or is severely curtailed. He produces very little directly for his own family consumption. In the 1940's only about 15 per cent of American workers were self-employed as farmers; another 15 per cent were self-employed businessmen and professional men; and the other 70 per cent were hired employees in manufacturing, mining, construction, transportation, and other public utilities, wholesale and retail trade, financial services, and government.

This remarkable change in the structure of the American economy has an important bearing on the people's understanding of the workings of economic society. As our economy has grown in size and in the greater dependence of everybody on everybody else, the average American sees less and less connection between his own work and the things he and his family consume. As the economy has become more productive, it has become much more difficult for the people who work in it to understand it.

A man who produces things for himself or his family or exchanges his labor directly with his neighbors, like the typical American of 1820, does not need to be told that he must work hard and produce more if he is to get ahead. The farmer or businessman who manages his own business, the man who produces things for consumption by his own family, or who exchanges his labor with his neighbors, understands the certain connection between his own efforts and his rewards. His incentives to work and to save for the future are direct and powerful. As the saying goes, he "knows the score" through his own daily experience.

[2] These figures are taken from *Automobile Facts* of May, 1949, a publication of the Automobile Manufacturers Association of Detroit, Mich.

But the man who works for a pay check, possibly one among thousands of others in a factory, cannot see these fundamental relationships so easily. It is not so clear to him that he gets more if he produces more. It is quite possible that he doesn't. If his wages are lower than he thinks they should be; if he loses his job through no fault of his own, he does not understand the reasons. Lack of understanding breeds mistrust and suspicion. He is apt to believe that his bosses can do as they please about how much is produced, about how many men they employ, about prices, wages, and profits. He does not usually understand that the "bosses'" powers of decision are severely limited by the necessity of fitting their work and their decisions into a cooperative system of production and markets.

These conditions are inherent in our complex but highly productive economic system, in our vast national and international distribution and marketing system, and in our money economy, and better understanding is needed to get the most out of our system and to make it run smoothly.

The Industrial Revolution and the Factory System. The increased complexity and efficiency of the American economic system that has just been outlined is one of the major results of the developments in eighteenth- and early nineteenth-century England that collectively are known as the Industrial Revolution. These were the "great inventions" in the textile industry and the practical development of the steam engine that together led to the introduction and amazing growth of the factory system of manufacturing. Division and specialization of labor, which we have observed as one of the primary causes of economic problems, existed from earliest times in some degree, but the Industrial Revolution greatly accelerated this form of production. It is worth while to pause briefly to describe the early beginnings of mechanical power and the factory system that have had such important economic consequences.

It is interesting to note why the use of mechanical power and of power-driven machinery and the factory system happened to develop first in England. One of the important reasons was that because of its virtual monopoly of sea-borne commerce, English merchants had accumulated more capital than they could use except with continual expansion of their operations. And for this expansion they needed more and more manufactured goods for export. The supply of capital and the need for goods stimulated invention and the commercial development of these new ideas. This is doubly interesting because this situation of nearly two centuries ago has continued and is still characteristic of individual capitalism today. The accumulation of a surplus (which we call capital) and new opportunities for its use for still more production are still the basic problems of a progressive economy. And today, just as two centuries ago, it is the nation with surplus capital which can take advantage of opportunities when they arise.

Hargreave's spinning jenny, invented in 1764, was the first of the great inventions that was to transform the economic and social conditions of the Western World. In 1769 Arkwright invented an entirely new method for spinning yarn and thread. The third major invention was Crompton's spinning "mule," so named because it was the hybrid offspring of Hargreave's "jenny" and Arkwright's roller-process spinning machine.

Before the introduction of these new machines spinning and weaving were household or cottage industries. The machines were small enough to be used in the average cottage and manual power was sufficient. But Arkwright's and Crompton's machines were too big to be so used and required more power than could be applied by foot or hand. The new methods and the new machines and the increased power demand required specially constructed buildings of large size and the installation of a source of mechanical power. Hence the factory. Large numbers of "mill hands"—men, women, and children—were recruited for the new mills as this new form of industry organization superseded the less productive cottage industry.

Thus factories in the modern sense were born out of the great inventions of the textile industry and out of the steam engine and out of the need for special factory buildings to house the new bulky machinery. It was a new thing in the world, and like most revolutionary changes, the factory system developed new social and economic problems along with its economic gains.

These developments of the factory system and of mechanical power came later in the United States. Before the Revolutionary War, English policy impeded the growth of manufacturing in the United States; it was not until the middle of the nineteenth century—just about a century ago—that manufacturing in the United States began to grow rapidly. It was not until 1880 that only half of the labor force was engaged in farming and the other half in manufacturing and in service occupations. It was not until 1900 that the number of workers in manufacturing exceeded the number engaged in farming.[3]

The Second Major Objective of an Economic System. The economic problems that were accentuated by the development of the factory system and that arise more directly from the production of goods are not the only problems with which economics has to deal. There is another broad area that has been given increasing attention since the bitter experiences of the deep depression of the 1930's. This area includes the important problems of stability of employment and business activity—the prevention or amelioration of mass unemployment and of the swings of business from boom to depression. A successful economic system should not only produce abundantly but it should produce steadily.

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[3] The extent to which division and specialization of labor has been carried in present-day manufacturing operations can be illustrated by a few examples. In the manufacture of small alternating-current motors up to 15 horsepower, there are seven major subassemblies (such as the frame, brackets, rotor, stator, coils, and winding, etc.). These seven subassemblies require 191 work stations and 196 operators.

A mechanical refrigerator steel cabinet requires 535 different operations for fabrication, finishing, and assembling. These operations are performed in straight-line production at 162 work stations by 288 operators.

Small distribution transformers used in the local distribution of electricity are assembled in a production line in which 16 kinds of operations are performed by 50 workers.

A successful economic system, then, has two different goals or objectives. The first of these objectives is the goal of progress through increased production and especially greater production per person. This is the most elementary and obvious purpose of organized economic activity. It demands an aggressive, dynamic economy that is continually in a state of change. The second of these major objectives is that progress shall be steady with no wide fluctuations in business activity or employment. It is relatively easy to achieve stability without progress—to achieve stability with poverty. This is the stability of large parts of China and India which, obviously, we do not want. It is much more difficult for a wealthy society than for a poor society to achieve stability.

These two major objectives—progress and stability—are those that any economic system should strive to reach if it is to meet normal human needs and desires. They are objectives, for example, on which an American individualist, a British Socialist of the Labor party, and a member of the Communist party in Moscow might be expected to agree. Suppose we repeat the essential requirements of a successful economic system as they were listed a little while back and take another look at them with our minds focused on this intriguing thought of universal application.

The first objective we stressed is greater production and economic progress measured by more production per person and to be attained by use of the most suitable organization of society and by use of the most effective tools and equipment.

This objective, we repeat, requires that means be provided:

a. To induce people to work and produce abundantly;
b. To produce the kinds and quantities of goods that people want most;
c. To assign people to the kind of work they can do best;
d. To distribute the goods produced in a way that will be satisfactory to the producers (who are also the consumers) and for the greatest good of the whole society.

The second major goal is that progress be maintained steadily, without serious unemployment and without serious fluctuations of boom and depression.

Surely these are objectives on which everyone can agree and which any successful system should strive to achieve.

Institutions and Principles. Clearly there is nothing in these major objectives that individualist, socialist, or communist would not desire. The ends of any desirable economic system are the same. But differences begin to appear as soon as we consider how these ends are to be attained.

Each of the major economic systems that have developed out of the political and social philosophies and out of the experience of different nations—socialism or communism or private individual capitalism—has proclaimed these same objectives of progress and stability, but each of the several applications of these different philosophies has set up different means to attain these universally desired ends.

The American system of individual capitalism has developed its own basic institutions and principles that cannot be changed or violated without destroying the character of the system. It is important that we keep these basic institutions and principles in mind.

1. There is first the institution of private property. Without private property individual capitalism cannot exist.

2. There are the related institutions of the private business firm and the privately owned farm. These business units are the foundation of cooperative economic activity. Each of these units enjoys the freedom to produce, what and how much it will, subject only to its individual resources, its ability to satisfy the needs and desires of its customers, and the rights of other producing units.

3. There is individual freedom of choice, freedom to act, and individual responsibility for success or failure. Each individual and each business unit is responsible for its own success or failure. The business firm that does not meet the test goes broke; the individual who fails is taken care of by his fellows in one way or another. But the individual responsibility remains; it may be met by the individual or it may be transferred to other individuals. The government enters this situation only to act as the intermediary between those who pay taxes and those who require help.

4. There is the principle of free and active competition among business firms for customers' dollars. This is one of the disciplines of individual capitalism that businessmen, farmers, and labor unions continually attempt to avoid, but they escape only at the risk of greater peril.

5. Finally there is the principle that the goods and services produced should be distributed in proportion to the value of the individual contributions to production. This principle of rewards proportional to contribution leads to wide differences among incomes because individuals differ widely in ability, energy, training, and opportunity. Many good people deplore the inequality inherent in individual capitalism and would abolish it if they could. But long experience has shown that inequality, however it may offend the

humanitarian, cannot be materially reduced without damage to the interests of the whole society through decrease in production. It has one outstanding virtue: it leads to more and more production.

Under private individual capitalism the individual, privately owned farm, and business firm are distinctive organizations that carry on the largest part of the production functions of the society. In the United States there are about 3 million business firms ranging in size and importance from the small retail store or shop up to the giant corporations that may employ 100,000 workers. There are some 6 million farms of which about half are subsistence farms that have little, if any, influence on the business or recorded income of the nation. There are then at least 6 million business units that produce goods or services for commercial markets. It is at once the strength and the weakness of the individual enterprise system that it contains these millions of separate centers of initiative and planning that, to a considerable extent, determine how well or how poorly the American economic system works. The millions of individual managers of farms and business firms determine what shall be produced and how much. This decentralization of initiative and planning undoubtedly is favorable to progress, but it also contributes to instability. How it is controlled and regulated to produce the goods and services that consumers want most will be covered presently.

Some Comparisons. It will be instructive to note how distinctive these principles and institutions are to individual capitalism and how they differ from the corresponding basic institutions and principles of the other economic systems that are important in the world.

Communism as practiced in Russia has abolished the institution of private property and has abolished the private business firm and privately owned farm as completely as possible. British Socialism has excluded private ownership from certain major industries such as coal, railroads, air and road transport, electric-power generation and distribution, communication, and banking.

Individual freedom of choice and initiative is almost completely absent in the Soviet system and to an increasing extent under British Socialism. Individual initiative and planning are replaced more or less by over-all planning of production and distribution by central government agencies.

To the extent that government agencies have taken over the function of production, private competition is replaced by state monopoly.

According to the principles of theoretical communism and socialism, the means of production are held in common by the state. They are owned by all the people in principle, but actually are controlled and managed by the state. Under communism the possessions and earnings of the individual go into a common fund which is redistributed by the state in accordance with the needs of the individual.

In the early years of the Soviet Union, Lenin tried to follow this communistic principle of payment for work according to individual need and not according to individual contribution. But this plan had to be abandoned in favor of the principle of "incentive" incomes of private capitalism in order to induce the workers to work and to produce more.

Incentives. The over-all purpose of these institutions and principles of individual capitalism is to induce the members of a cooperative society to work together as energetically and as effectively as they would if each man were producing directly for his own family's needs. The success of an economic system depends primarily on how completely it provides these incentives for greater effort, more skillful effort for greater production. The several national systems that are now in use—American, British, or Russian—can be assessed by this standard of measurement. These different systems may be expected to succeed in reaching the goals of greater production and greater stability to the extent that each system contains the incentives to produce.

Economic progress, especially, requires that the economic system include strong incentives and inducements that will persuade men to work; to save; and, because savings are in the form of money, inducements to spend savings for more and better tools and stocks of goods. The system, to be successful, must offer adequate and fair rewards for working and for saving.

The Members of the American Economic System. We have discussed some of the purposes and the institutions of our American economic system. What are the structural members or subdivisions into which the system may be logically divided and through which the system functions? It will be instructive to take a look at the complete system, to observe its different members, how they work together in one coordinated system, and to note the essential part each member plays.

The American economic system as it has been developed through more than a century of trial and error can be divided into three major parts: the factors of production; the money and banking system; and the regulatory pricing mechanism.

The Factors of Production. Economists recognize two direct factors of production: land (and other natural resources) and labor—both mental and manual. From these direct factors of production are derived two others: capital goods—the tools of production—and ownership or management. In earlier times ownership and management were usually combined in the same persons; today, ownership and management are separated to a considerable extent, and especially in the largest business units, with ownership taking a much less active part in management.

Suppose we take a closer look at these four factors of production.

The first factor is our rich and varied stores of natural resources, our raw materials: fertile lands, adequate rainfall, temperate climate, water power, stores of oil, gas, minerals, particularly coal and iron—the foundations of modern industry.

There is in the second place a vast army of farmers, factory workers, storekeepers, transport workers, and other "service" workers whom we can call the production army—roughly 60 million strong. They do the work of the nation, and the goods and services they produce make up the national product and national income that measure the volume of economic activity.

Then there is the third factor: the arsenal of tools and facilities that equips the production army. This is the fixed capital of our economic system: the improved farms, their buildings and equipment, a multitude of factories, the mechanical power and the power-driven tools, the railroads, the electric-power systems, the telegraph and telephone systems, the public roads, and the truck, bus, and private automobile; and the stocks of goods and money—the inventories—that are necessary to carry on the production and distribution of goods. The vast extent and the variety of this American store of capital goods is unique in the history of the world.

Even the most simple examples of modern production of goods require production facilities and equipment of one kind or another: buildings and tools and mechanical power; in short, capital. People who own the tools of production are contributing these necessary factors, and are in a position to exact a price for their use. They demand and receive a share of the goods produced; they receive this share because they have contributed the use of their property. The owner of the tools is a producer in the sense that he has contributed to the ultimate result—the production of goods. He is one of the partners in the cooperative organization to make things and do things that consumers want and are willing to pay for.

These are three of the factors of production: land, labor, and capital. But what brings them together in the right proportions to produce useful goods? Other countries have a large or larger reserve of undeveloped raw materials; many countries have larger populations; none, however, has employed these two primary factors to produce the store of man-made capital that we possess or to produce the wealth of consumers' goods that we enjoy.

The answer to this question or a large part of it should be looked for in the fourth factor of production: ownership management. Ownership management, or professional management in the corporation, is the dynamic factor in leadership of the American economy; the ownership management army is large in numbers but small in relation to the total working population.

As we have seen in the examples of the division of labor in present-day factory operations, few workers in industry produce a complete, useful article. Most workers perform one or several operations on a single part, and the day's output of the operator has no value by itself. He cannot use it himself; neither can he sell it. It has value only when combined with the work of hundreds or thousands of other workers in mines, transport, mills, and in other factories.

The organization of this cooperative effort that finally produces an article that some consumer can use and will buy is the role of management. Economists have customarily used the French word *entrepreneur* for this function, but we will use the more familiar word management. Management may be owner management or the type of professional management that has almost completely replaced the older type of owner management in larger corporations. Management also brings together in a working organization the fixed capital, the money capital, and the staff services outside of direct production, such as research and engineering, accounting, purchasing, and the selling organization in addition to the more directly productive factory organization.

It has been pointed out that there are at least 6 million individual business firms or farms that contribute to the commercial markets of the country. These constitute 6 million separate centers of ownership or management where decisions are made and action is started. Management in these millions of centers organizes the factors of land, labor, and capital into effective production units; makes the important decisions as to what work and how much work shall be undertaken.

To the considerable degree that management has the power of initiative and decision, management carries the great responsibility for the success or failure of the American economic system to operate satisfactorily.

In short, the army of management brings together and organizes the technical and rank-and-file workers of the larger production army, the varied raw materials and other natural resources required by production, and the fixed capital and working capital that are so important in highly mechanized American industry. Considering the economic system as a complicated series of production-exchange transactions, management connects the multitude of workers with the ultimate consumer through a long series of production and distribution operations.

The dynamic factor, the initiating energy in American industry, is the army of management—the army of millions of self-employed farmers and businessmen, of professional managers of industrial corporations, and the owners and professional managers of the service industries. These men more than others make the decisions that determine the level and direction of business activity.

Throughout these studies it should never be forgotten that in the American economic system we are dealing with production *and exchange* on a voluntary basis. Back of the decision-making, organizing army of management there stands the ruling army of consumers which possesses the final vote and veto power. In a wealthy economy the customer has the last word. He can refuse to buy. He establishes the effective demand for each commodity and product in the market, even for the product of the producer who has no direct competitors.

Obviously there could be no production in an uninhabited desert. But given adequate natural resources and labor, the plane of living—the amount of goods available per person—would still depend on the amount of capital per worker and the way in which the three other factors are organized for production by management. The quality and effectiveness of the entire process of production depends in the final analysis on the quality of management.

The Importance of Money and the Banking System. The startling changes in the American economy that have converted a society of self-employed farmers into a society composed largely of employees working for wages or salaries have increased tremendously the importance of money in the economy.

Money, as we shall learn later on, is that element of the economic machine that makes the division of labor and the distribution of goods and services possible. It is an essential element of every system. The division of labor and the exchanges of labor for money and of money for goods would be impracticable on the modern scale without some kind of money.

It is obvious from everyday experience that economic activity cannot grow to any extent even within a single village community without the use of money. Even where the farmers, artisans, and merchants exchange goods for goods or goods for services, if the farmers grow much more wheat than they need for themselves, the local miller can no longer pay for it in flour or in milling service. Even if the local merchant buys the surplus wheat and the farmers take their pay "in trade," the transactions can be handled and accounts kept most conveniently in terms of money prices. So money as a medium of exchange soon becomes necessary. The use of money for this purpose is so familiar and its convenience so obvious, we need not elaborate. Farmers and village craftsmen receive money for their surplus goods and for their services. They, in turn, buy with money the labor, the services, the goods they need but cannot obtain through their own labor and resources.

There is danger just because this use of money is so familiar that the real nature of the exchanges may be forgotten. Money is just a convenient mechanism to make indirect and roundabout exchanges easy to complete. If Farmer Jones has a colt he does not want to raise but he does need another cow, it is obviously easier for him to sell the colt for money to someone who wants a colt but who may not have an extra cow, and to buy with money a cow from another farmer who probably would not need another colt. The important thing to keep in mind is that back of the money transactions the ultimate purpose is the exchange of goods and labor. The labor or the things that we exchange are the important factors. Money in exchanges is merely the "medium of exchange" used to facilitate the trade.

But we cannot dismiss money so summarily. Money has properties and habits on its own account that sometimes have disturbing consequences. If money income is spent without delays, the use of money introduces no new condition. But money is convenient for delaying exchanges as well as for making them promptly. Money makes it easy to store surplus wealth. Economists say that money has among others two important functions: it serves as a "medium of exchange"; it also serves as a "store of value." It is inconvenient and costly to store surplus goods. Many kinds of goods deteriorate when stored. But money can be held for future use without serious cost and usually without loss. So, money makes it easy to store goods (actually to store claims for future goods) and makes it easy to slow down the exchanges. In times of poor business many people who have money and could exchange it for goods and labor, prefer to hold it for future use.

Money introduces a flexible link in the exchange of goods which makes it easy to change the rate of spending and consequently the rate of production. The use of money makes it easy to interrupt the steady production of goods for exchange and to produce serious fluctuations in business activity and employment. As we will discover in later chapters, a flexible money supply is one of the important causes of undesirable swings from boom to depression.

Money as a part of the mechanism of an economic system is absolutely essential. No society in which people exchange their labor and specialize their labor could function without some kind of money system. But the misuse of money and credit is one of the dangers of our complex economic system and a potent ingredient of its major problem of instability.

The Pricing Mechanism. The money mechanism is one element which is a necessity in any form of economic society. A related mechanism that is dependent on the money mechanism is the pricing system. These two mechanisms—money and prices—make the cooperative society with its division of labor and exchanges of labor a going concern and a workable system.

It will be remembered that one of the primary requirements of an economic system is the ability to divide the goods and services produced among the members of a society in a way acceptable to its members. It will also be remembered that in the American system of individual capitalism this distribution is made according to the principle of individual reward in some proportion to individual contribution to production. The value of the goods received by each worker is, in principle, equal to the value of his or her contribution to the work of production.

This principle can be put in practice in a free society only when the value of the services contributed to production can be measured in money and the value of the goods and services desired in exchange can be measured in the same units. These values of work done or services contributed and the values of the goods and services produced are, of course, the familiar prices of goods and services. It is this ability to measure contributions and rewards in money prices that makes the individual capitalist system workable.

In economics prices are defined broadly to include the measurement of the value of all four factors of production: rent from the use of land (land includes other natural resources), wages or salaries for labor, interest for the use of capital, and profits for the function of management. The economist recognizes all of these payments as prices; he may even call the costs of production "supply prices" in contrast to "market prices."

The pricing mechanism also plays an important part in meeting the requirements of a workable system. These requirements were, you will remember:

a. The system should induce people to work;
b. It should produce the kinds and quantities of goods and services that the people want most;
c. It should make it possible for workers to do the kind of work they wish to do;
d. It should divide up the goods and services produced in proportion to individual contributions.

The pricing system is the impersonal market regulator that makes it possible to meet these requirements. Each dollar spent is a vote for the kinds and quantities of goods that are most desired. Wages and salaries are in some rough relation to the scarcity of different kinds of skill and the market value of the production. Scarce factors of production and products bring higher prices that limit their use; plentiful factors can be obtained at lower prices that encourage their use. There are many factors other than price that influence the use of labor, materials, and capital in production, but the price system is the over-all regulator which determines who produces what in the American economic system. It is the mechanism that really determines the decisions of the millions of independent individual managers of American industry and that leads them to produce the goods and services that the American people want most.

The operation of the pricing mechanism immediately suggests the close connection that must exist between economic problems and problems of human nature. Even the simplest exchange involves an agreement on price and this implies bargaining. The single price system which has been found most effective in modern merchandising only obscures the fact that every sale is a mutually acceptable bargain. Even if the customer has no opportunity to offer a lower price, the customer still registers disagreement and casts a negative vote by refusing to buy. Buyers or sellers collectively set the price depending on the relative strengths of their "bargaining position"; on the relative strengths of the demand for goods or services and the supply of goods or services in the market. We say there is a "buyer's market" when demand is weak and buyers "call the tune," or we say there is a "seller's market" when demand is strong, goods are scarce, and sellers can set the price.

It may appear that this economic system of ours with its millions of independent business firms and farms on the supply side, and many more millions of customers on the demand side; with its millions of kinds and varieties of goods and services; with more millions of different prices of these goods and services in different markets and under different conditions, poses a tremendously complicated problem for a voluntary pricing system to solve. However, long and varied experience, including the experience involved in the vast changes in the American economy that have been described, has demonstrated the ability of the actual American pricing system to control and regulate the production and distribution in the world's richest, most extensive, and most complex economy. The forces that control prices are strong enough, despite the frictions and restrictions of actual markets, to do the job and sometimes to do it against our personal desires or in opposition to political promises. As we shall see, prices go up and go down in their own time in response to economic factors and without regard to the individual preferences we may have for higher prices or lower prices and without regard to the desires of government, labor, farmers, or businessmen.

Every economic system needs some mechanism such as the price system of individual capitalism to control production and distribution of its goods and services. Systems based on theoretical socialist or communist principles also find some kinds of pricing mechanism necessary. But these other systems depend more directly on control of production and distribution of goods by government agencies; by direct allocation of raw materials, labor, and capital to specific production programs; and by rationing of scarce goods to consumers. The impersonal forces of the free pricing system are also modified by various subsidies paid by the government (out of the ample share of the total national production it takes for its own purposes) to groups of workers or other citizens to increase the rewards of the particular group out of proportion to its contributions to production. The results of these other mechanisms of control and our own brief experience with allocations of raw materials and rationing of scarce commodities during the Second World War justify the opinion that the impersonal pricing mechanism with a minimum of government controls and despite its seeming planlessness has done a more satisfactory job of allocating and rationing scarce materials, labor, capital, and commodities than has been done so far by any other mechanism.

The Role of Government in the Economic System. The American Constitution deliberately provided for a weak central government of divided powers. The founders were afraid of too much centralized power, so specific and limited powers were granted to the Federal government and powers not delegated were reserved to the states and to the people.

It is no accident that the United States has grown to be the richest and most powerful industrial nation under this weak central government, subject to the periodic control of the people—a government that, compared with most governments in the world today, exercises very little control over the daily business activities of its citizens.

But even in the United States with its limited constitutional government, the government plays a major role in the economic life of the country. In these postwar years, state, local and federal government activities absorb about one-quarter of the entire production of the country in taxes. Government agencies employ about one-seventh of the entire working force.

Government introduces a third major factor in the economic organization of the country, the other two being private business firms and individual consumers and investors. Government receives income and expends it mainly for the employment of people and for purchases from business units. The government is a third party—often unwelcome—in every exchange; government through taxation takes income from one group of citizens and through its spending activities redistributes this income to other groups.

Government, and especially the federal government, carries specific responsibilities for the successful functioning of the American system of individual capitalism.

1. It regulates the money system of the nation.
2. It defines and limits the rights of private property.
3. It should maintain equal opportunity in the economic field for its citizens and ensure that justice prevails.
4. It levies and collects taxes and tariffs.
5. It should provide military protection and other essential public services that the people desire and are willing to pay for.

These obviously are important duties, and the government shares with private business the major responsibility for the successful operation of the system. The failure of government to carry out its responsibilities in these fields of competition, taxation, and money can be as serious as the failure of private business to fulfill successfully its obligations.

A special economic problem arises when the government enters the market and buys goods with newly printed money, as during the recent World War and during deficit spending as in the 1930's. Under these circumstances there is no exchange of goods for goods with money performing its simple role of medium of exchange. The new money does not represent income from the production of goods that appear in the market place. The government, because of its power to create money, is able to exchange paper money for real goods. In wartime the goods are destroyed and the paper money remains. The violent economic disturbances that accompany and follow major wars are rooted in these distortions of the normal process of exchanging goods for goods.

The Important Role of Spending. Up to this time the economic system has been treated as a system for the production and distribution of goods. That, of course, is the primary purpose of an economic system. And the American system has been presented as a complex mechanism having various essential elements—the factors of production, a money mechanism, and a pricing mechanism. The economic system is all this and much more. It is a living organism made up of people with all the hopes and fears and incentives or lack of incentives that influence human behavior. It is bedeviled then by all the frailties, the shortcomings, the imperfect foresight inherent in human nature, and a successful economic system must be able to accommodate these human shortcomings. Many of the shortcomings and inequities for which the system of private capitalism is blamed are actually the result of these human failings, and a change in system would not necessarily eliminate the trouble.

When discussing the money mechanism, the fact that money makes it easy to postpone exchanges was mentioned. This introduces a whole new series of problems in the operations of the economic system. People may behave in their production activities just as energetically and effectively as if they were producing for their own immediate needs; but they can refuse to exchange their surplus production (in the form of money) with other members of their community, and usually these people who can accumulate a surplus are the people who can earn the most and contribute most to production. In more familiar language they can save a part of their income by declining to spend it. This behavior can lead to reduced aggregate production and lower incomes for everyone.

This possibility of too little spending introduces problems of total national income: how it is used and the factors that determine its size and trend. It greatly affects the second broad objective of an economic system—the attainment of greater stability.

As we shall learn in the fourth part of this book, private management, individual investors, and government agencies together determine the overall level of business activity and the responsibility for maintaining stability. They do this by their decisions to spend or not to spend.

The economic system then is concerned with and influenced by human reactions, motives, and emotions—by all of the psychological factors that influence people's behavior. As we will find many times during the course of our studies, economic activity is not something that can be defined and reduced to mechanical or even completely logical procedures.

This outline of the objectives, the institutions or principles, and the mechanisms of the American economic system may appear to make it a hopelessly complicated structure. It *is* a complicated structure, and an oversimplified picture, even at the start of our study, would serve no useful purpose. It is hoped, despite this complication, that this outline has given the reader some inkling of the interdependence of the parts of the system, of their purpose and how they work together.

This brief outline of the American economic system has undoubtedly raised many questions. It is hoped that the answers will become clear as they are developed in the pages that follow. But before beginning this more detailed description and analysis of how the American system works, it will be useful to consider what the American system is, its magnitude, and how it has grown.

Summary

Economic organization is necessary whenever people join together for the production of goods. The purpose of an economic system is to make this joint effort possible and effective.

A successful system needs to do four things:

a. The system should induce people to work;
b. It should match production with needs;
c. It should make it possible for workers to do the kind of work they wish to do;
d. It should determine how the goods and services produced are to be divided among the people of the community.

When a man is working for his own and his family's needs, all of these requirements are met without special organization or system. But when men work together, organization and system become necessary. The growth of the division of labor in factory production, and the development of the United States into a nation of wage and salary earners, has increased tremendously the complexity of economic organization.

The Objectives of the Economic System. The economic system has two major objectives: the first of these goals is greater production per person, which may be called the goal of economic progress; the second is the goal of greater stability of business activity and employment.

Institutions and Principles. The American economic system operates through certain fundamental institutions and principles. They are:

1. The institution of private property;
2. The institutions of the private business firm and the privately owned farm;

3. The individual freedoms of choice and initiative, and individual responsibility for success or failure:
4. The principle of free and active competition;
5. The principle of compensation in proportion to contributions, which leads to inequality of incomes.

These principles and institutions are characteristic of private capitalism, and differ radically from the corresponding institutions and principles of other practical systems based on socialism or communism. These principles and institutions of individual capitalism provide the *incentives* that make it work.

The Structural Members of the American System. The American system has developed its own structure and mechanism based on the preceding principles and institutions. The American system can be divided into three major members or subdivisions:

1. The factors of production;
2. The money and banking system;
3. The pricing system;

The four factors of production are:

1. Natural resources;
2. Labor;
3. Capital;
4. Ownership management (the entrepreneur).

Management, distributed among millions of private business units, organizes the other three factors of production in the right proportions for the desired results.

The money and banking system is an essential part of any economic system. Without some money system there could be no production and exchange of goods on the modern scale. But money also makes it possible to postpone exchanges, and the misuse of the money and banking system can cause wide fluctuations in business activity and employment.

The pricing mechanism is the regulator of the economic system. Prices measure the value of work performed and the value of the goods produced. It is this ability to measure the value of contributions and rewards in money prices that makes the system workable.

The Role of Government. The American government, compared with most other governments today, exercises very little control over the daily business activities of its citizens, but notwithstanding this fact, the government plays an important role in the economic system. The government carries specific responsibilities for the successful functioning of the system, such as the regulation of the money system, the definition of the rights of private property, the establishment of justice under law, the protection of business firms and the public against illegal monopoly, the maintenance of order, the imposition and collection of taxes (its share of national production), and the establishment of the necessary military forces and other essential public services that the people desire and are willing to pay for.

These obviously are important duties, and the government shares with private business the major responsibility for the successful operation of the system.

The Important Role of Spending. The money mechanism makes it easy to postpone exchange. People, and it is usually the people who can earn the most, can decide not to exchange their surplus income with other people; they can decide to save a part of their income and not spend it. This behavior can lead to reduced aggregate production and lower incomes for everyone.

This possibility of too little spending introduces the problems connected with the second major objective of the economic system—the goal of greater stability.

Review Questions

1. Why do we in the United States require an elaborate, complicated economic system? Why not return to the relatively simple barter economy of our colonial ancestors?
2. State the two major objectives of a desirable economic system.
3. State four or five basic institutions or principles on which the American system of private capitalism rests.
4. How do these institutions or principles provide the incentives that make the American system workable?
5. State two or three ways in which the principles (or institutions) of Soviet Communism or British Socialism differ from those of American private capitalism. How do these differences affect the incentives for production and economic progress?
6. Structurally, what are the three major members or mechanisms through which the American system functions?
7. How may the use of money adversely affect the stability of production and employment?
8. What are the major functions of the pricing system in the American system? What alternative mechanisms are employed in a socialistic or communistic society such as the U.S.S.R.?
9. What role does government play in the American system? How does the government enter as a third party in daily exchanges of goods?
10. What is the important role of spending in any economic system that uses money?

2 THE STRUCTURE AND GROWTH OF THE AMERICAN ECONOMY

Before taking up the explanation of principles and relationships of the economic system, it will be instructive to learn more about the structure, the size, and the growth of the American system as it has developed over the past 100 or 150 years, from its small and not very promising beginnings, up to its present position as the most powerful industrial nation the world has seen. This chapter will provide useful background for the more detailed studies to follow.

What determines a nation's economic position in the world? Some of our less fortunate foreign friends have been quick to answer that for the United States it is luck and good fortune: good luck that our territory has been far removed from the destruction of two world wars; good fortune that we possess the world's greatest stores of raw materials. They say our natural wealth makes it possible for us to persist in our planless freedom while other nations must husband and control their own more limited resources. Because we were endowed with all this natural wealth, we cannot fail to grow still wealthier.

Without question, natural resources are a necessary foundation for economic progress. We are indeed fortunate in our inheritance of fertile land, good climate, and mineral wealth; but anyone who reads the whole record will find many other reasons for the growth of the American economy to its present size and productive capacity. There are intangible, as well as tangible, factors behind this remarkable growth: our political institutions and constitutional, federal form of government; a culture favorable to competitive struggle; an energetic, adventurous population, trained to hard work and thrift. But in these economic studies our attention will be directed to the more tangible factors of natural resources, the labor force, the amazing growth in the use of mechanical power, and the organization of industry.

The Relation of Natural Resources to Population and Wealth. But, after all is said, rich natural resources are a basic requirement. Most of the arable land of our planet is in the Northern Hemisphere. Of the total land surface of the planet only about 7 per cent is capable of cultivation, and only about 20 per cent can be used for farming or grazing.

There are two distinctive areas in the world that can support dense populations. One is the highly industrialized urban areas, made possible by the nearby location of coal, iron ore, or other mineral resources. These areas, principally located in western Europe, western and central Russia, and in the United States and Canada, comprise the wealthy or potentially wealthy regions of the world. The other distinctive area of dense population consists of fertile river bottoms or the irrigated lands of China, India, and other less extensive regions which possess good land, but where mineral resources are lacking.

The contrast between these two types of densely populated areas defines quite clearly the nature of the population problems of different countries. In western Europe and in the United States, as outstanding examples, the heaviest population density is in the industrial urban areas. Population is increasing slowly because of voluntary restriction of the birth rate in spite of favorable death rates. There is no serious pressure of population on resources.

In the densely populated agricultural areas of Asia population is growing rapidly in spite of very high death rates. The massed humanity of the overpopulated river valleys of India particularly presses against the food supply; population is held in check only by high death rates and calamity. Unfortunately neither food from other areas nor emigration to other areas will reduce the pressure of population on food supply under the existing culture. The rice that can be grown determines the size of the population that can survive. Any increase in food supply reduces the death rate and brings the population up to the level permitted by the larger food supply; any emigration temporarily reduces the pressure on the food supply, but in time this advantage is lost by population growth. Voluntary restriction of the size of families and more production per person through better farming methods and industrialization are necessary conditions for the solution of this age-old problem of poverty in regions without mineral resources.

At least 80 per cent of the people of the world now living in Asia, Africa, eastern Europe, and the Middle East exist under conditions unbelievably poor according to Western standards. Colin Clark, an English economist, who has studied national incomes of many countries, estimates that the poorest half of the world's population, principally in Asia, barely exists on only one-sixth of the real income of the top 20 per cent of the population, and that 80 per cent of all the people in the world enjoy only one-third or less of the real income of the top 20 per cent.

In a recent pioneering study of the Chinese economy by a Chinese scholar, Ta Chung Liu, under the sponsorship of the Brookings Institution, the average figure for China's gross national production during 1931–1936 is estimated at about 8.5 billion American dollars, or about one-eighth that of the United States during the same period. After taking into account some differences in the economic structures of the two countries, the Chinese figure is increased to about one-quarter of the United States figure.

The annual consumption *per person* in China is estimated at an equivalent of $37 — 9 per cent of the corresponding American figure. This figure appears shockingly low, but, on the other hand, it is probably no lower than for some subsistence farm families in the United States, and, in any event, it is difficult to measure the real differences in living conditions in two such different cultures.

It is all too evident that the normal condition of most of the people of the world is one of scarcity combined with long hours of unremitting labor. Our Western problem of temporary unemployment in depression is minor compared with the problem of never-ending poverty faced by most of the world. We are among the fortunate 20 per cent who can produce more than necessary for bare subsistence; but our surplus, large as it may seem, is insignificant when measured against the needs of the world. No one nation, not even all the Western nations, can supply the rest of the world with the additional goods they need for a decent plane of living. The hungry world can be fed and clothed and housed at a decent level only when institutions and cultures can be changed, when population growth can be checked to match available resources, and when farming and other production methods in backward regions can be greatly improved.

Mineral Resources of the United States. About 7 per cent of the world's population lives within the United States. These people produce in normal times about 12 per cent of the food produced in the world and a much larger part of the world's manufactured goods. Even before the Second World War this 7 per cent of the people of the world produced 32 per cent of all the manufactured goods produced in the world. The United States still possesses—after a century of rapid development and use—and in spite of our heavy contribution to the recent war effort—a larger share of the world's resources of the more important minerals than any other nation.

The percentages of the world reserves of seven important minerals for the three major industrial nations are given in Table 2 • 1. The bare figures do not tell the whole story. The figures for the British Commonwealth, for example, do not show the serious disadvantage suffered by this group of nations because of the wide geographical separation of some of the related materials—iron ore and coal, for example. In the Soviet Union coal in the Donets Basin is 2,000 miles distant from iron ore in the Urals. The industrial strength of the United States is multiplied by the economical location of its mineral wealth within a relatively small area which is made even smaller by its extensive, low-cost transportation system.

The United States during 1940-1944 produced 99 per cent or more of its consumption of molybdenum, magnesium, sulphur, phosphate rock, nitrates, coal, potash, petroleum, fluorspar, mercury, salt, natural gas, and iron ore.

Table 2·1. National Distribution of Estimated Reserves of Seven Important Minerals

Mineral	United States, per cent	British Commonwealth, per cent	U.S.S.R., per cent
Coal	45	27	11
Petroleum	35	1	14
Iron ore	34	23	11
Copper	22	26	16
Lead	35	45	2
Zinc	34	26	12
Bauxite	3	31	3

The country produced approximately 80 per cent of its consumption of bauxite (for aluminum) and zinc; and between 50 per cent and 66 per cent of its consumption of these important minerals: copper, lead, tungsten, and graphite.

The more important minerals for which the United States must look beyond its own borders include mica, antimony, platinum, manganese, cobalt, tin, asbestos, and nickel.[1]

The Size and Growth of the Labor Force. The second primary factor of production is the labor force. The labor force has increased from about 13 million persons in 1870 to more than 60 million in 1948. In 1940 the labor force was roughly 40 per cent of the total population and 48 per cent of that part of the population ten years of age or more.

The most important long-term trend in the composition of the labor force is the increasing number of women who work for wages or salary. The proportion of women with gainful occupations has doubled since 1870—from 13 per cent of all females ten years old or more in 1870 to 26 per cent in 1940. In 1870 one worker out of seven was a woman; there was one out of five in 1920; and one out of four in 1940.

Another significant trend in the character of the labor force is the declining demand for unskilled common labor and the increasing demand for office and clerical workers as compared with the demand for shop production workers. Both of these trends are the result of the increasing mechanization of industry. With increasing mechanization and reduced man-hours of production labor for each unit of output, fewer workers are engaged directly on production jobs and more are engaged in supervisory, technical, staff, and clerical operations. If these two groups are defined very roughly as those paid wages by the hour and those paid salaries by the week or month, U.S. Census data show that the latter class increased from 3 per cent of total employment in 1870 to 10 per cent in 1910 and to 16 per cent in 1930.

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[1] These figures for mineral resources are taken from a publication of the National Industrial Conference Board, New York, Inc., "America's Resources for World Leadership," 1947.

Table 2·2. Size and Distribution of Labor Force, 1870–1940

	Population		Labor force			Percentage distribution labor force		
Year	Total, millions	10 Years old or over	Number	Per cent of population	10 Years old or over	Agriculture	Manufacturing	Trade and service
1820	.			.	..	73.0	12 0	15.0
1860			..	.		60 0	20 0	20.0
1870	39 905	29 1	12 9	32.3	44 4	53.5	21 9	24.6
1880	50 262	36.8	17 4	34.6	47.3	50.0	23 8	26 2
1890	63 056	47 4	23 3	37.0	49 2	43.4	25.6	31.0
1900	76 094	50 0	29 1	38.2	50.2	38.2	27 2	34.6
1910	92 407	71.6	37.4	40.5	52.2	31.6	31 1	37.3
1920	106 466	82 7	42.4	39.8	51 3	27.6	32 9	39.5
1930	123.077	98.7	47 6	38 7	48.2	21 9	30 9	47.2
1940	131.970	110.3	53 3	40 4	48 3	18 5	31 7	49.8

Statistically the labor force is a definite part of the whole population that is set apart within definite boundaries. Actually people are continually moving in and out of the labor force; it is by no means a fixed group of people. Usually there is a seasonal shift with 3 or 4 million more job seekers in July than in January. Also in an average year there may be 10 million more people temporarily within the labor force than the number of jobs. Prosperous times may actually decrease the number of people seeking work because more young people can afford to stay in school and fewer housewives and old people are obliged to look for work. Conversely, depression drives more people into the labor force at a time when jobs are scarce.

Table 2·2 shows the size and distribution of the labor force since 1870. Figure 2·1 shows the significant changes in the distribution of the labor force among the three major occupation groups. Agriculture, forestry, and fisheries comprise the primary occupations; manufacturing, mining, and construction make up the secondary; and trade, service, and all other occupations make up the tertiary group.

It is possible to use the distribution of workers among the primary, secondary, and tertiary occupations as a measure of the relative economic position of different nations. As a nation increases its wealth and current income by increasing industrial production, there is a shift of workers out of farming into manufacturing, mining, and construction. Then as industrialization becomes more important, there is a slower growth in secondary occupations and a more rapid increase in the number of workers in trade, in the professions, and in the service industries.

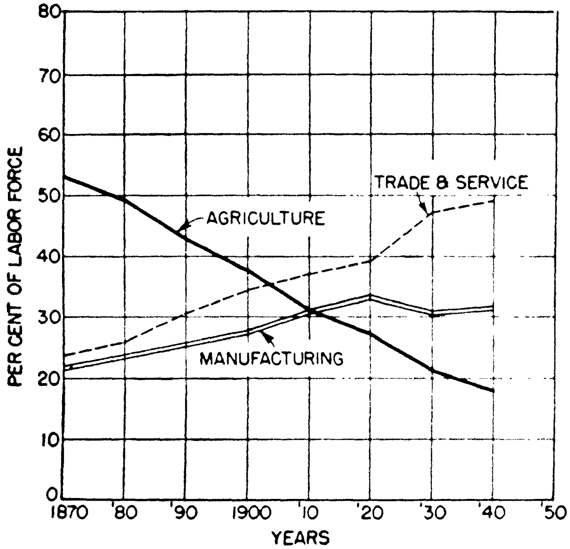

Fig. 2 • 1. Changing Composition of the United States Labor Force

Agriculture, forestry, and fisheries absorbed nearly three-quarters of the labor force in 1820, a little more than half of the labor force in 1870, and less than one-fifth in 1940. Manufacturing, mining, and construction increased from one-eighth of the labor force in 1820 to nearly one-third in 1940. The trade and service occupations increased from 15 per cent of the labor force in 1820 to nearly one-half in 1940. These changing distributions are symptomatic of increasing efficiency in production and an increasing wealth and plane of living.

In those countries near the top of the economic scale usually 25 per cent or less of the labor force is able to produce the food for the entire nation; and wealthy nations can afford to use around 50 per cent of the working force in tertiary occupations. Countries near the bottom level of living standards usually reverse this distribution; the labor of more than 50 per cent of the working force is necessary to feed the nation and not more than 25 per cent of the working force can be spared for the trade and service industries. China and India, for example, require the labor of 60 to 75 per cent of the whole labor force to feed the nation; only 10 to 25 per cent are employed in the trade and service occupations. At the other end of the scale in the United States, Canada, Great Britain, and Australia, less than 25 per cent of the whole working force is required to feed the nation and 50 per cent or more can be used in the tertiary occupations.

The development of the United States from a relatively poor agricultural nation into a wealthy industrial nation can be traced through the distribution of its labor force. In 1820, 73 per cent of the labor force was used to feed the nation and only 15 per cent could be spared for the less necessary professional, trade, and service occupations. In 1940 agricultural workers had dropped below 20 per cent and professional, trade, and service workers had increased to nearly 50 per cent.

The same kind of development in its initial stages can be observed in the distribution of the labor force of the Soviet Union. There is a downward trend in that part of the labor force demanded by the most essential occupations and a rising trend in secondary and tertiary occupations.

In 1940 the U.S.S.R. had a working force composed of 53 per cent peasant farmers, 14 per cent rural wage workers, 10 per cent industrial workers, and 13 per cent upper-class officials, professional workers, government employees, and other clerical, trade, and service workers. The remaining 10 per cent were in forced-labor camps. The number of workers in these concentration camps has been estimated (there are no official figures) from a low of 5 million to a high of 20 million. This estimate of 10 per cent of the labor force is equivalent to 7.5 million. The total 1940 labor force is estimated at 75 million and the total population at 174 million. Judged by this distribution of its labor force, the Soviet Union was in 1940 at about the stage of economic development as the United States was 70 or 80 years ago.[2]

The Legal Structure and Organization of American Industry. The American economy operates through an organization of individual business firms and privately owned farms that total some 10 million separate units. Farming is conducted almost entirely by individual farm owners or farm tenants. Manufacturing and mining are carried on largely by corporations, but there are also individual owners and partnerships in this field. Transportation and other public utilities are very largely operated as corporations. The third major group—retail and wholesale trade, finance, service, and professional proprietors and organizations—contains the largest number of corporations—about 70 per cent of all corporations making income-tax returns—but also contains many more individual proprietors and partnerships.

Individual owners and general partners in a business enterprise are liable for the debts of the business up to the value of everything they may own. The very considerable advantage of the corporate form of business organization is that the owners—the shareholders—are liable only to the extent of their shareholdings. Thus owners of corporations enjoy all the advantages of ownership without danger of loss beyond their investment.

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[2] The figures (but not the conclusions drawn) are taken from David Dallin, "The Real Soviet Russia," pp. 96–98, Yale University Press, New Haven, 1947.

With individual proprietary and partnership forms of business organization, ownership and management usually go together. The unlimited liability associated with this form of organization makes any other arrangement undesirable, to say the least. In partnerships the silent partner who invests his capital but takes no part in managing the business sometimes finds his entire estate in jeopardy because of debts incurred by his more active partners. Plainly a partnership is no safe place for absentee ownership and delegated powers. It is not difficult to understand why the corporate form of organization has become the only form for businesses that require large amounts of capital.

There are other reasons why the corporate form has replaced the partnership for large units. With the growth in large-scale manufacturing and national distribution of goods, the capital requirements have grown far beyond the possessions of single capitalists and, with a few notable exceptions, beyond the capital resources of groups of capital owners who might be willing to form partnerships. On the other hand, the corporation facilitates the association of large numbers of capital owners in a single enterprise.

With most corporations, and particularly with the larger corporations, ownership and management are separated. Shareholder owners delegate these management responsibilities to directors, and directors delegate the day-by-day management to professional managers—the officers. This separation of ownership and management responsibilities has some disadvantages and dangers in that dishonest directors or managers may not always act in the interest of owners, but it has one overbalancing advantage: The most skillful managers can rise to occupy the most important positions even though they do not possess capital. In earlier days management responsibility was more apt to be inherited without regard to the management ability possessed by second- and third-generation owners.

The shift from the single proprietor and partnership form of organization to the corporate form went on during the nineteenth century and the movement was far advanced at the beginning of the present century. By 1900 probably 50 to 55 per cent of all American industry was being conducted by corporations. This percentage increased slowly to 60 per cent in 1919 and to 63 per cent in 1929.

Further increase in the relative importance of the corporate organization of industry will be necessarily slow since saturation has already been reached or closely approached in many of the areas where the corporation is suitable or advantageous.

Saturation is practically complete in banking, railroads, and public utilities; over 90 per cent in manufacturing and mining; and nearly 50 per cent for the balance of nonfarm industry.[3]

It was mentioned that there are some 10 million private business enterprises within the United States. Of this number about 6 million are farms. Only half of this total, however, are really business enterprises in the sense that products are sold in the market for cash. The other 3 million farms are family subsistence units where money plays a relatively small part in the way of life, where most of the things produced are consumed within the farm family and only a small quantity of commodities and labor are exchanged within the community by barter or for money. Even within the wealthy United States there are communities of subsistence farms where money exchange plays only a minor part in the business of earning a living. A recent study of incomes showed, for example, that in 1935-1936 six per cent of self-supporting families (that is, families not receiving relief income from the government) in 15 Georgia and South Carolina villages and 5 per cent of nonrelief families in 5 Iowa counties had a family income under $250 a year or an average annual money income of, say, $50 per person.[4]

Table 2·3. Number of Wholesale and Retail Establishments—1929 and 1939

Kind of establishment	1929	1939
Wholesale	168,820	200,573
Retail	1,476,365	1,770,355
Service	....	648,026
Total ...		2,618,954

The total number of industrial and commercial enterprises in the United States increased 2.83 times, from 782,000 in 1881 to a maximum of 2,213,000 in 1929. Over the same period population increased 2.36 times. These groups of business enterprises increased at a somewhat higher rate than the population. The number of enterprises had declined to 1,909,000 by 1945 as a result of depression, but also as a result of the war during the late years of the period.[5] This record is shown graphically in Fig. 2·3.

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[3] Terborgh, George, "The Bogey of Economic Maturity," p. 136, Machinery and Allied Products Institute, Chicago, 1945.

[4] "Income Size and Distribution in the United States," National Bureau of Economic Research, Inc., New York, 1943.

[5] This record compiled by Dun and Bradstreet (taken from *Statistical Abstract of the United States*, p. 53, 1946) includes mining and manufacturing, wholesale and retail trade, construction and commercial service enterprises. It does not include financial and some other classifications of service enterprises. Using more inclusive figures, the Department of Commerce estimates tha' the total number of companies in operation in the first quarter of 1948 is slightly above the number consistent with the gross national product (*Business Week*, Sept. 11, 1948).

Wholesale and retail establishments and service shops and stores make up the largest group of business firms after farms. In 1939 there were 2.6 million establishments of these kinds. Table 2 • 3 shows how this total was distributed and how it compared with an earlier year.

The total number of manufacturing establishments (having products valued at $5,000 or more) was 173,575 in 1914. This number increased to its all-time high of 210,268 in 1919, was 206,663 in 1929, and 184,230 in 1939.

It is interesting to observe the surprisingly large number of these manufacturing establishments that are very small. Tables 2 • 4 and 2 • 5 show this segregation by size according to wage earners and according to value of products for the year 1939.

Table 2 • 4. Manufacturing Establishments 1939—Classified According to Number of Wage Earners

Number of wage earners	Establishments	Number of wage earners	Per cent of total establishments	Per cent of total wage earners	Cumulative per cent of establishments	Cumulative per cent of wage earners
None to 5	84,245	203,052	45.7	2.6	45.7	2.6
6–10	49,015	542,679	26.6	6.9	72.3	9.5
21–50	23,646	764,814	12.8	9.7	85.1	19.2
51–100	11,908	848,423	6.5	10.8	91.6	30.0
101–500	13,111	2,741,634	7.1	34.8	98.7	64.8
501–1,000	1,495	1,024,297	0.8	13.0	99.5	77.8
1,001–2,500	634	937,136	0.3	11.9	99.8	89.7
2,501 or more	176	824.532	0.1	10.5	99.9	100.2
Total	184,230	7,886,567	100.0	100.0	100.0	100.0

If 500 wage earners is taken as the dividing line between medium size and large size, 98.7 per cent of all establishments are small and medium, and 1.3 per cent are large, although 64.8 per cent of wage earners are in small and medium plants and 35.2 per cent are in large plants. As a rule it is the 1.3 per cent of manufacturing plants (about 2,300 plants) and the 35.2 per cent of wage earners that make the newspaper headlines in industrial and labor news.

It is this complex and widespread organization of some 6 or 7 million different units (if the 3 million subsistence farms are excluded) that is coordinated and regulated by the price system of the American economy. In thinking of the industry of the United States we are apt to emphasize the relatively small number of large corporations. As can be seen from Tables 2 • 4 and 2 • 5 there were in 1939 only 176 plants with more than 2,500 employees and only 1,473 plants that produced as much as $5 million annual output. In 1942 among 383,000 industrial corporations, 197,000—slightly more than half—had assets of $50,000 or less. Only 826 had assets of $50 million or more, but these large corporations held nearly 60 per cent of the total assets of all the corporations. From the standpoint of total assets these large corporations are important, but from the standpoint of efficient operation of the economy, coordination of effort and future growth, the small corporations are vitally important. This was dramatically demonstrated in 1946 when strikes in the plants of small suppliers shut down some of the largest automobile plants.

Table 2·5. Manufacturing Establishments 1939—Classified According to Value of Product

Value of product	Establishments			Value of product		
	Number	Per cent	Cumulative per cent	Millions dollars	Per cent	Cumulative per cent
5,000 to 20,000	60,593	32.9	32.9	$ 681	1.2	1.2
20,000 to 50,000	42,083	22.8	55.7	1,354	2.4	3.6
50,000 to 100,000	25,490	13.8	69.5	1,811	3.2	6.8
100,000 to 250,000	24,718	13.4	82.9	3,921	6.9	13.7
250,000 to 500,000	13,066	7.1	90.0	4,627	8.1	21.8
500,000 to 1,000,000	8,706	4.7	94.7	6,111	27.2	49.0
1,000,000 to 5,000,000	8,101	4.4	99.1	16,217	12.2	61.2
8,000,000 and over	1,473	0.8	99.9	22,121	38.9	100.1
Total	184,230	100.0	100.0	$56,843	100.0	100.0

The Use of Mechanical Energy. The use of mechanical energy in any nation is a rough measure of its industrial power and wealth. By this measure, as with others, the United States stands at the top.

The use of mechanical energy in the United States over a period of nearly 100 years, from 1850 to 1944, is given by decades in Table 2·6. During the 50 years of most rapid growth, from 1870 to 1920, horsepower-hours available per person multiplied 17 times, or at a rate compounded of nearly 6 per cent annually. From 1920 to 1944 the available energy per person increased at a much lower rate of 1.82 times the 1920 figure, and at an annual rate of about 2.5 per cent.

The horsepower-hours of energy available per person is further evidence of the large use of capital relative to man power in doing the nation's work. Available mechanical power increased nearly 58 times as much as man power over the entire period of 94 years covered by the figures of Table 2·6.

Electric-power Output of Different Countries. A partial but in its field a more reliable measure of available power is the production of electrical energy by public utilities. This information also is available for different

Table 2·6. Available Mechanical Horsepower-hours per Year, 1850–1944*

Year	Horsepower-hours† per year from mechanical sources, billions	Population‡ continental U.S., millions	Annual horsepower-hours per person
1850	1.0	23.261	43.0
1860	1.6	31.513	50.8
1870	3.2	39.905	80.2
1880	6.8	50.262	135.3
1890	16.8	63.056	266.4
1900	31.3	76.094	411.3
1910	74.8	92.407	809.4
1920	145.0	106.466	1,362.0
1930	199.5	123.077	1,621.0
1940	260.4	131.970	1,973.2
1944	342.7	138.083	2,482.0

* Estimates made by authors of "America's Needs and Resources," The Twentieth Century Fund, Inc., New York, 1947.

† Horsepower-hours. *Ibid.*, Appendix 32, p. 787.

‡ Population figures: *Statistical Abstract of the United States*, 1946.

countries. Table 2·7 shows this production for a number of nations and for three recent periods.

Table 2·7. Electric-energy Production—Monthly Average—Billions of Kilowatt-hours*

Country	1938	Second World War peak	1946 (estimated)
United States	9.5	19.0	18.6
Germany	4.6		1.2†
U.S.S.R.	3.3 (estimated)		
Japan	2.4	2.9	2.2
Canada	2.2	3.4	3.5
United Kingdom	2.0	3.2	3.4
France	1.5	1.7	1.8
Italy	1.2	1.6	1.4
Norway	0.8	0.9	0.9
Sweden	0.7	1.0	...

* Source "America's Resources for World Leadership," National Industrial Conference Board, Inc., New York, 1947.

† British and American zones only.

The Size and Growth of the National Income. Up to the First World War there was little information outside of the government census statistics concerning the size of the American economy, and less appreciation concerning the need for information of this kind. The new problems of the war turned many men's minds toward this new field for economic research. Only a few interested economists and statisticians had tried before the war to measure national economic resources and capacities. Makeshifts of statistical measurement that were necessary during the First World War demonstrated the need of more facts concerning the nation's economy, and when the war was over, many government and private research agencies took up the task and began to supply the need. As a result we now have statistics that are reasonably complete and accurate. Even though most of this work has been done since 1920, there are approximate estimates that provide a rough picture of national production and the growth of the economy since the earlier years of the Republic. Naturally these estimates of earlier years are less accurate than the figures for the past 40 or 50 years.

Robert F. Martin, then economist of the National Industrial Conference Board, has made estimates of national income by decades starting with 1799 at the very beginning of the Industrial Revolution in the Western Hemisphere.[6]

Martin estimates the realized national income (cash income received by individuals) in 1799 at 677 million dollars. On the same basis of estimating, the income in 1929 is 79.5 billion dollars—an increase of 117 times. However, increase in population and increase in the general price level were responsible for most of this increase. If the dollar income is reduced to a constant price level (by an index of wholesale prices with 1929 as the base) and placed on a per capita basis, the dollar annual income per person in 1799 is $211 and in 1929 is $625—a total growth of a little less than three times. Even this more modest increase should be discounted to some extent because of the considerable changes in social conditions and customs during these 130 years. In the early period the great majority of the people lived on farms or in small towns and villages, as discussed in the preceding chapter, and it was customary for each family to produce a part of its own food. The census figures show that in 1800 only 4 per cent of the people lived in towns or cities of 8,000 inhabitants or more. Now more than half of the people are so situated. In 1790 only five towns—Boston, New York, Philadelphia, Baltimore, and Charleston—had more than 8,000 inhabitants each, and their combined population was under 135,000. It was also customary for each household to produce much of its own clothing and to provide its own fuel and light. The home, the school, and church were the social centers; entertainment also was a home product without any considerable money cost. Then in addition there has been a gradual but substantial transfer of work from the household to the market place. Household work does not show up in money exchanges and in national income estimates. Many examples come to mind: The use of baker's bread instead of homemade bread; the use of canned and packaged foods; the greater reliance on apartment services, laundries, and restaurants. Some quantitative measures of these transfers of work are available. Since 1899 wheat flour used by commercial bakeries has increased from about 15 per cent to 45 per cent of the total. Production of canned vegetables has increased from 0.275 cases per person to 1.39 cases per person. The employment in commercial laundries and dry-cleaning establishments has increased 2.5 times over these 40 years.

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[6] MARTIN, ROBERT F., "National Income in the United States, 1799–1938," National Industrial Conference Board, Inc., New York, 1939.

Money incomes then in those simpler times did not, by any means, measure the plane of living as completely as money incomes do today. Although estimated additions are made to cash income to take care of some of these kinds of family-produced incomes, the result in all probability does not give money incomes that truly represent real incomes. People undoubtedly lived better, so far as the essentials of food, shelter, and clothing were concerned, than these small money incomes suggest.

The progress of national income by decades with all the reservations that have been mentioned is given as total income and income per person in Table 2·8 and in Fig. 2·2.[7] The curve of income per person shows two periods of declining incomes and two periods of increasing incomes. It was not until 1839 that income per person reached the level of 1799, but these 40 years were years of recovery from the Revolutionary War and from the effects of the Napoleonic Wars in Europe. However, these census years of 1809, 1819, 1829, and 1839 were all years of more or less severe depression, and incomes of intervening years were undoubtedly higher than the incomes here recorded. But it is probably true that the trend of incomes during these 40 years did not improve appreciably. During this same period population more than tripled (from 5.3 million to 17 million). It is true that total national income increased, but it did not increase more than population increased. It was not until a half century had passed that there seems to have been appreciable improvement in real income per person in spite of rapid increase in population. It is interesting to note that it was not until this same period that manufacturing began to grow rapidly.

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[7] *Logarithmic Charts:* It will be noted that Fig. 2 · 2 is plotted with an irregular scale for the vertical divisions of the chart. The irregular spaces are proportional to the logarithms of the numbers shown. The horizontal scale is divided into spaces of equal size. This chart is known as a single log chart. If both scales were log scales, it would be a double log chart. The single log chart shows rates of growth—how fast some activity is growing over the years, as in this case, or it can be used to show how fast something is moving through space; as, for example, velocities. Log charts tell us "how fast"; arithmetic charts (with equal scale divisions) tell us "how big" or "how much." Equal vertical distances on a single log chart show equal ratios or per cents. It will be noted that 0.1:1.0, or 1.0:10, or 10:100 (or 0.1:0.2, or 1:2, or 10:20) occupy the same vertical distance on the chart. Consequently, parallel lines on any part of the chart show equal rates in increase in the quantity recorded because parallel lines have a constant vertical distance between them. A straight line shows a constant rate of increase; a curved line shows a varying rate of increase.

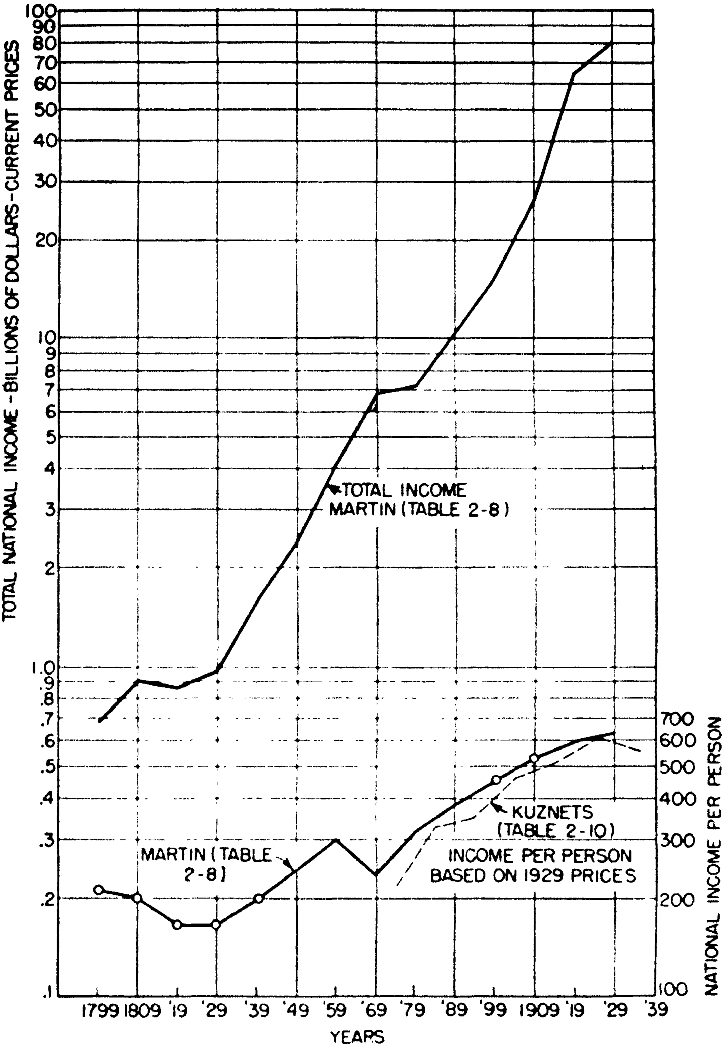

Fig. 2 • 2. National Income, 1799–1929

Total national income at current prices increased more than 100 times from 1799 to 1929. Real income per person at 1929 prices increased from $211 to $625, somewhat less than 3 times.

For 30 years from 1829 to 1859 there was rapid improvement in real income per person. The Civil War caused a decline in real incomes, but this decline was masked by the price inflation and increase in money incomes occasioned by the war. Beginning with 1869 there was continuous increase in the trend of total money incomes and real incomes per person despite the two intervening serious depressions of the 1870's and the 1890's.

During 100 years from 1829 to 1929 total money income increased 81.5 times at a compound rate of 4.5 per cent a year. Real incomes per person increased at a compound rate of 1.3 per cent a year. For the shorter period of 60 years—from 1869 to 1929—real incomes per person increased at a higher compound rate of 1.6 per cent a year.

Table 2·8. National Income in the United States*—1799–1929

Year	Millions dollars		Dollars income per capita	
	Total income at current prices	Income based on general price level† 1929 = 100	Dollar income at current prices	General† price level 1929 = 100
1799	$ 677	$ 1,092	$131	$211
1809	915	1,423	130	202
1819‡	876	1,576	93	168
1829‡	975	2,083	78	166
1839‡	1,631	3,282	98	197
1849§	2,420	5,450	107	241
1859	4,311	9,212	140	300
1869	6,827	8,843	180	233
1879	7,227	15,442	147	315
1889	10,701	23,780	173	385
1899	15,364	34,142	205	456
1909	26,456	48,102	292	530
1919	62,945	62,199	599	592
1929	79,498	75,929	654	625

* From Robert F. Martin, "National Income in the United States, 1799–1938," National Industrial Conference Board, Inc. New York, 1939.

† Price index used is a combination of the Snyder Index, FRB Index, N. Y., and National Industrial Conference Board Index

‡ Years of depression

§ A year of peak prosperity—Railroad construction and California Gold Rush were major favorable factors

It is interesting to see how income attributed to different major industries has changed over this long period as shown by Table 2·9. During the early period from 1799 to 1829, agriculture accounted for nearly 40 per cent of the total income. Manufacturing in the new nation was surprisingly small; it accounted for only 5 per cent of the national income in 1799 and only 12 per cent 50 years later.

The same trends are illustrated by the changing nature of United States imports and exports. In the period of national infancy imports were largely manufactured goods and exports were foods and raw materials—a situation typical of new and colonial economies. As the nation grew, these relations changed materially. Just before the Second World War our imports of manufactured goods were less than half our similar exports, and imports of food and raw materials were double the exports in these categories.

Government activity has become an increasingly important part of the economy or, more accurately stated, government has redistributed by taxation an increasingly large part of total national income. In 1799, for example, 1 per cent of the total national income came to individuals from government sources.

Table 2·9. National Income, 1799–1929—Percentage Distribution by Industry—Based on Values in Current Prices*

Year or decade	Agriculture	Mining	Manufacturing	Construction	Transportation; public utility	Trade	Service	Government	Finance and Miscellaneous
(1) 1799	39.5	4.8		7.9	24.0	23.0		1.0	†
(2) 1849	31.5	12.5		5.7	17.0	31.0		2.3	†
Average of									
(3) 1869–1879	20.5	1.8	13.9	5.3	11.9	15.7	14.7	4.4	11.7
(4) 1879–1889	16.1	2.1	16.6	5.5	11.9	16.6	13.6	4.9	12.6
(5) 1889–1899	17.1	2.5	18.2	4.9	10.7	16.8	11.8	6.0	12.0
Decade									
(6) 1899–1908	16.7	3.1	18.4	4.5	10.7	15.3	9.6	5.6	16.0
(7) 1909–1918	17.7	3.3	20.8	3.2	10.7	14.5	8.2	6.3	15.4
(8) 1919–1928	12.2	3.1	22.2	3.9	11.3	13.7	9.4	8.6	15.7
(9) 1919–1928	10.5	2.5	21.9	4.4	9.8	13.6	11.6	9.6	16.1
(10) 1929–1938	8.5	1.7	19.4	2.9	10.0	13.6	13.9	14.4	15.6

* Sources Lines 1–8 based on R. F. Martin's "National Income in the United States, 1799–1938," National Industrial Conference Board, Inc., New York, 1939.

Lines 3–10, inclusive, taken from Simon Kuznets, "National Income [illegible]ummary of Findings," Table 11, p. 40, National Bureau of Economic Research, Inc., New York, 1946.

Lines 9–10 based on Kuznet's estimates of national income.

† Included in Trade and Service.

In 1936 under peacetime conditions and policies nearly 20 per cent of the national income payments originated in government sources from taxes or from newly created money. The Civil War increased this relation to only 4 per cent (from 2.3 per cent in 1859). In 1899 it was still only 6.5 per cent, and reached 9.9 per cent in 1918 as a consequence of the First World War. It dropped back to 8.5 per cent in 1923 and 8.6 per cent in 1929. Deficit spending during the 1930's boosted this ratio to 20 per cent, as noted. The consequences of the Second World War have, so far, maintained government taxation at this high percentage figure despite the large growth in money incomes.

It will be desirable to supplement and support these estimates of national income made by Martin by the later estimates made by the National Bureau of Economic Research.[8] These estimates shown in Table 2·10 cover the seventy years from 1869 to 1938, inclusive. The figures are averages for each decade and are, therefore, more representative of average conditions than are the single years of Martin's estimates. Nevertheless these later estimates of national income do not differ importantly from the Martin estimates. Both sets of figures are plotted in Fig. 2·2.

Table 2·10. National Income, 1869–1938—Based on 1929 Prices*

Decade	Annual average national income, billions dollars	Population, millions	National income, dollars per person
1869–1878	$ 9.3	43.5	$215
1879–1888	17.9	54.8	326
1889–1898	24.2	67.6	357
1899–1908	37.3	81.5	458
1909–1918	50.6	97.7	517
1919–1928	69.0	112.8	612
1929–1938	72.0	126.0	572

* Sources: National Income from estimates by National Bureau of Economic Research, Inc., New York.
Population from averages of annual estimates in *Statistical Abstract of the United States*, 1942.
Table taken from Simon Kuznets, "National Income: A Summary of Findings," p. 32, National Bureau of Economic Research, Inc., New York, 1946.

A Physical Measure of Long-term Growth. Measures of long-term growth of the economy that depend on measurement of money income inevitably suffer the handicap of variation in the average prices of commodities and services. Although the income figures cited have been adjusted as well as they can be to a constant price (1929), there is no really satisfactory way in which this can be done for periods as long as we are considering and for such dissimilar groups of goods and services as are included in the total national production. However, the difficulty of price changes can be avoided by using physical measures of the growth of the national economy. The production of iron and steel probably is the best inclusive physical measure of the growth of manufacturing industry and especially of the durable goods industries. One hundred years ago annual pig-iron production was about 900,000 tons. At the 1947 production rate the same tonnage could be made in less than a week.

Before 1910 pig-iron production was the best measure of total iron and steel production. Since 1910 the tonnage of steel ingots and castings has exceeded the tonnage of pig iron because of the remelting of scrap, and steel production now is considered the best measure of the size of the industry.

Table 2·11 shows the growth of the American iron and steel industry in total and in tons of pig iron or steel per person. Figure 2·3 shows how this significant figure—tons of pig iron or steel per person—has grown over the years. From about 1870 to the end of the First World War the use of iron and steel increased rapidly—from 0.052 ton per person to 0.396 ton per person in 1920—7.6 times (the average annual compounded rate for these 47 years—1873 to 1920—is nearly 4.5 per cent). From 1920 to the present time

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[8] KUZNETS, SIMON, National Income: "A Summary of Findings," National Bureau of Economic Research, Inc., New York, 1946

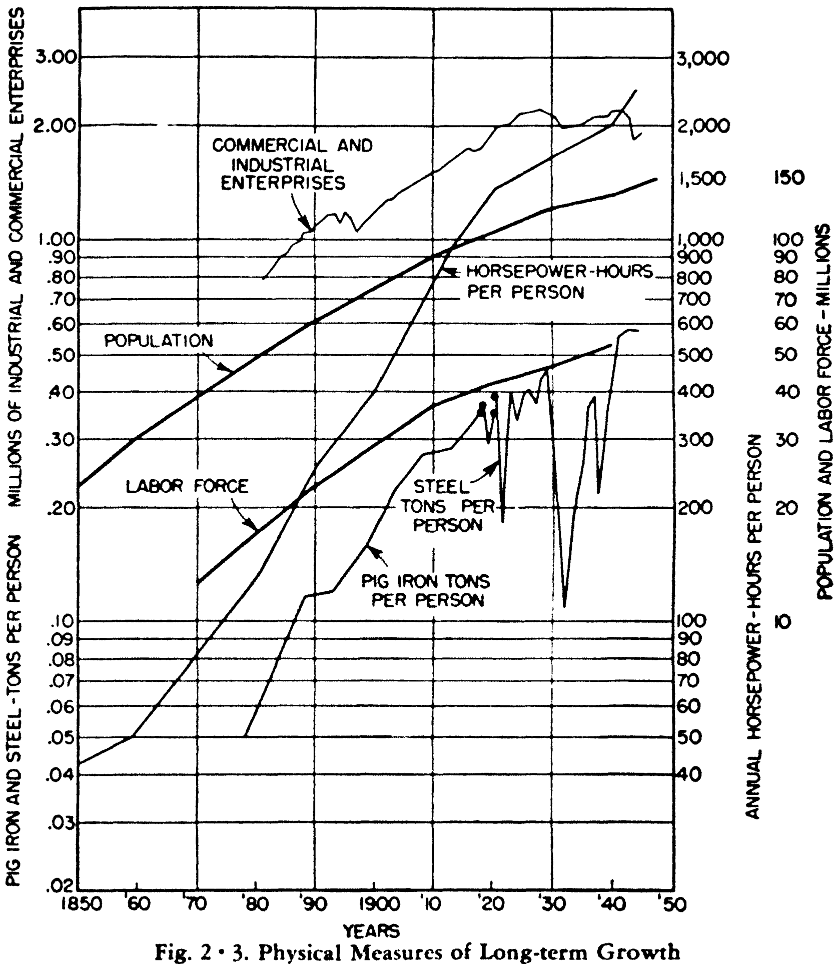

Fig. 2 • 3. Physical Measures of Long-term Growth

The long-term growth of the American economy is illustrated by more rapid growth in iron and steel production and in the use of mechanical power than in population and working force.

the increase has been quite irregular because of three obvious depression valleys. The steel production per person increased from 0.396 ton in 1920 to 0.580 ton in 1944 (1.46 times) at an average annual rate compounded of 1.5 per cent.

The increase in iron and steel production per person from 1870 to 1920 is much greater than the increase in real income per person, which is another

Table 2·11. Iron and Steel Production—1871–1944*

Pig iron and ferrous alloys				Steel ingots and castings			
Year	Annual production, thousand long tons	Population,† millions	Production, tons per person	Year	Annual production, thousand long tons	Population,† millions	Production, tons per person
1871–1875	2,248	43.006	0.052				
1876–1880	2,563	48.179	0.053				
1881–1885	4,301	54.100	0.080				
1886–1890	7,079	60.496	0.117	1890	4,277	63 056	
1891–1895	8,133	66.970	0.121				
1896–1900	11,492	73.492	0.156	1900	10,188	76 094	
1901–1905	18,240	80 672	0.226				
1906–1910	24,025	88.809	0.271	1910	26,095	92 407	
1911–1915	27,518	97.219	0 283	1915	32,151	100 549	
1916–1920	37,010	104.242	0.355				
1918	38,527	104 550	0 369				
1919	30,595	105.063	0 291				
1920	36,437	106.466	0.342	1920	42,133	106 466	0 396
1921	16,688	108.541	0.154	1921	19,784	108 541	0 182
1922	27,220	110.055	0 247	1922	35,603	110 055	0.323
1923	40,361	111.950	0 361	1923	44,944	111 950	0 402
1924	31,406	114.113	0 275	1924	37,932	114 113	0 332
1925	36,700	115 835	0 317	1925	45,394	115 835	0 392
1926	39,373	117.399	0 335	1926	48,294	117 399	0 411
1927	36,566	119 038	0.307	1927	44,935	119 038	0 377
1928	38,156	120 501	0 317	1928	51,544	120 501	0.428
1929	42,614	121 770	0 350	1929	56,433	121 770	0 463
1930	31,752	123 077	0.258	1930	40,699	123.077	0.331
1931	18,426	124 040	0 149	1931	25,945	124 040	0 209
1932	8,781	124 840	0.070	1932	13,681	124 840	0 110
1933	13,346	125.579	0.106	1933	23,232	125 579	0 185
1934	16,139	126 374	0 128	1934	26,055	126 374	0 206
1935	21,373	127 250	0 168	1935	34,093	127 250	0 268
1936	31,029	128 053	0 242	1936	47,768	128 053	0 373
1937	37,127	128 825	0 288	1937	50,569	128 825	0 393
1938	19,161	129.825	0 148	1938	28,350	129 825	0 218
1939	31,855	130 880	0.243	1939	47,142	130.880	0 360
1940	42,320	131.970	0.321	1940	59,806	131.970	0 453
1941	50,613	133.203	0.380	1941	73,964	133.203	0.555
1942	54,378	134.665	0.404	1942	76,814	134.665	0 570
1943	56,045	136.497	0.411	1943	79,318	136 497	0 581
1944	56,130	138.083	0.407	1944	80,037	138.083	0 580

* Iron and Steel Production, *Statistical Abstract of the United States, 1946*, pp 864–865

† Population estimates from *Statistical Abstract of the United States*, 1946, p 8

way of saying that a much larger part of the increase in real income was spent for durable goods than for other goods.

Figure 2 • 3 also shows some other physical measures of economic growth: the growth in population and in labor force; horsepower-hours per person; and number of commercial and industrial enterprises. It is significant that the number of these enterprises has increased roughly at the same rate as population. This fact has a bearing on the much discussed question of large versus small firms.

On the other hand, the use of mechanical energy per person has had a much higher rate of growth than any of these other measures.

Tons of steel used per person in a country is a significant indicator of the degree of industrialization of the economy; of its general nature; and to some extent of the standard of living which the economy is able to support. Among the principal industrial nations the United States holds a commanding position. Great Britain produced 13.3 long tons of steel in 1939—its maximum prewar production—for 46 million people, or about 0.3 ton per person. The Soviet Union produced not more than 20 long tons of steel in its maximum prewar production for 174 million people, or, roughly, 0.1 ton per person. At the lowest point during the Second World War steel-making capacity in the U.S.S.R. dropped to 15 million tons. For the end of their fourth Five-Year Plan in 1950 U.S.S.R. steel capacity is scheduled at 25 million tons. If the 1950 population is taken as 200 million, scheduled steel consumption would still be only 0.125 ton per person. This figure is to be compared with something over 0.6 ton per person of actual production in the United States in 1948.

Summary

What determines a nation's economic position in the world? Natural resources? Population? Capital resources? It is all of these plus intangibles such as its political and social institutions; a culture favorable to competitive struggle; an energetic, adventurous population trained to hard work and thrift.

Relation of Natural Resources to Population and Wealth. Only 7 per cent of the total land surface of the planet is capable of cultivation, and only 20 per cent of the total can be used for the farming or grazing, and can support a large population. And only those parts of the earth that combine fertile land, adequate rainfall, and temperate climate with rich mineral resources—especially coal and iron—can be industrialized and support a large urban population.

These essential resources are very unevenly distributed throughout the world, and, consequently, wealth is very unequally distributed among nations, and the planes of living vary widely. It is estimated that the poorest half of the world's population barely exists on only one-sixth of the real income of the top 20 per cent of the population, and that 80 per cent of all the people in the world exists on only one-third, or less, of the real income that the top 20 per cent enjoys.

Mineral resources of the United States, after a full century of rapid development and use, are still larger than those of any other country. The United States produces most of its own requirements of the principal minerals except antimony, manganese, cobalt, tin, asbestos, and nickel. Antimony, manganese, and tin are the principal minerals that must come from overseas.

The labor force of the United States has grown from about 13 million persons in 1870 to over 60 million in 1948.

The distribution of the three major groups of occupations—represented by agriculture, manufacturing, and service occupations—is a significant measure of the nation's economic development. In a wealthy industrialized country, agriculture constitutes a relatively small part of the labor force, and the service occupations make heavy demands on the labor force. In those countries near the top of the economic scale, 25 per cent or less of the labor force is able to produce the food for the nation; and wealthy nations can afford to use around 50 per cent of the labor force in service and trade. In poor nations, these figures are apt to be reversed, with, in some instances, 75 per cent of the labor force engaged in providing food for the people.

The Legal Structure of American Industry. There are about 10 million business firms or farms in the United States. Between 6 and 7 million individual firms or farms are commercial enterprises producing commodities for commercial markets. These individual enterprises may be owned and operated by single owners or by partnerships, or they may be organized as corporations. The controlling advantage of the corporate form of organization is that the owners of the corporation—the shareholders—are not liable for the losses of the corporation beyond their direct financial investment in the corporation.

The use of mechanical energy in a country is a rough measure of its industrial power and wealth. During the period of nearly a century — from 1850 to 1944 — the horsepower-hours per year increased nearly 350 times in the United States. The annual horsepower-hours per person increased nearly 60 times.

The national income of the United States increased from less than 700 million dollars in 1799 to nearly 80 billion dollars in 1929. National income doubled from 1929 to 1947. National income per person in terms of a constant value of the dollar (constant price level) was multiplied about three times over this period of 130 years. In 1929, the average person received about three times the real value of goods and services as the corresponding citizen of the new republic in 1799.

A final measure of the industrial strength and growth of the United States is provided by the production of iron and steel. One hundred years ago, annual pig-iron production was about 900,000 tons. At the 1947 production rate the same tonnage could be made in less than a week.

From 1870 to the late 1940's the use of pig iron or steel increased from 0.05 ton per person to nearly 0.60 ton per person; the use of iron or steel increased 12 times. This figure of 0.60 ton of steel per person in the United States is to be compared with 0.30 ton per person in Great Britain, and 0.10 ton per person in the Soviet Union.

Review Questions

1. What determines a nation's economic position in the world? What are the essential factors? What is the initiating or driving force in national economic progress?

2. What is the relative wealth or poverty of different nations? How can the problem of national poverty, as in China or India, be solved?

3. How can the distribution of the national labor force (among the three major kinds of industry) be used as a measure of relative national wealth?

4. Why has the trend in the structure of American industry been strongly in the direction of corporate organization and away from individually owned enterprises and partnerships?

5. What is the significance of the immense growth of the use of mechanical power in the United States over the past 100 years? How does this growth compare with that of some other countries?

6. Mark the following statements true or false:
   a. Total dollar income of the United States increased about 10 times over the past 100 years; 50 times; 80 times.
   b. Real income per person (that is, income measured in dollars of constant value) increased 10 times over the past 100 years; 5 times; 3 times.

7. Describe in general terms the growth in economic size and power of the United States during the half century from 1898 to 1948. Do you think anyone back in 1898 would have predicted the rate of growth that actually occurred during these 50 years? What does this past experience lead you to think concerning the possibility of foreseeing the economic growth of the United States over the next 50 years?

8. Give several reasons why money incomes per person in 1840 and 1940, for example, do not necessarily give a correct measure of the relative planes of living in these years.

9. Is pig iron or steel produced per person a better or worse measure of the plane of living of a people than money income per person? Has this physical measure of economic progress increased more or less than real income per person? (Refer to Figs. 2 • 2 and 2 • 3.) Why? How does this measure of economic progress compare in the United States, Great Britain, and the Soviet Union?

PART TWO. The Static System; Some Governing Principles

3. THE STATIC STATE

This chapter will introduce the student to the study of elementary economic theory — the explanation of the basic principles that have been crystallized out of experience. The popular reputation of economics as a science has suffered from a lack of understanding of the conditions under which its laws are applicable, and, also, because of a lack of understanding of the wide differences between these simplified conditions and the more complicated conditions of actual industry. It will be the purpose of this chapter to describe at some length the theoretical or laboratory model which has been developed by the classical economists to explain the behavior of the economic system of private capitalism. The very considerable and important differences between this model society and actual society will be stressed and perhaps overstressed in order to indicate the nature of the problems and to emphasize the difficulties involved in the application of economic principles to practical situations — a task with which most of this volume will be concerned.

In order to develop generalized principles in any field, whether it be a social science or a physical science, it is necessary to study behavior under simple conditions so that the influence of one factor can be studied at a time and in order that the effects of extraneous influences can be removed. In the study of the elementary laws of motion in physics, for example, it is assumed that there is no friction, or as another familiar example, the law of falling bodies is strictly true only if the effects of air friction are eliminated, as in a vacuum.

So in economics, many of its major generalizations have been developed under simplifying assumptions that in some respects idealize actual conditions and in other respects depart as completely from actual conditions as do laboratory experiments made in a vacuum.

The economist's most useful simplified society — his laboratory model, so to speak — is a society which has been idealized and simplified into something that is vastly different from any actual society. To begin with, economics deals with the conduct of people. The theorist is compelled to assume that people will act rationally and intelligently in their own interest and without restraint by any other person or persons. People are also assumed to act with full knowledge of conditions and facts affecting their own interests. Otherwise, no rational generalizations are possible. This ideal economic society also is assumed to be made up of a large number of individual buyers and sellers and producers. Then no producer or buyer or seller is important enough to affect market prices in his own interest. Free and open competition — what we will define more accurately later on as perfect competition — is assumed to exist. It is not our purpose at the moment to give a complete technical description of the economists' model society that has come to be known as the static state. That will come presently. We merely wish to show at this point some of the simpler assumptions that make this imaginary society differ importantly from actual society.

This brings us to another point that should be made clear before we take up the study of economic principles. Going back to the simple illustrations taken from mechanics, the assumption that there is no friction of any kind leads to some results that obviously are not encountered in real life. For example, if there is no friction of any kind, a heavy flywheel, once started revolving, will continue to revolve forever. Perpetual motion is not only possible but is inevitable under the assumption of a frictionless world. But we all know that perpetual motion — without the continuous supply of energy in some form — is impossible in the real world. To transfer the conclusions from the laboratory model to the real world without misunderstanding and error, we must be sure we understand the differences between the conditions of the laboratory experiment and of the real world and the effects of those differences.

Similarly, in the economist's model of the static state there are assumptions that lead to results that are never found in actual industry. In the static state there can be no overproduction of goods, there can be no unemploymen of labor and no idle factories except as a temporary condition. We know from painful experience, however, that all of these things do happen in the real world. Actual unemployment and actual production of goods that cannot be sold do not disprove the economic principles, but they do warn us that actual conditions differ from the assumptions and conditions of the theoretical model. A falling leaf in the wind does not obey the law of falling bodies. But that fact does not destroy our faith in the physical law. It should lead us to consider the conditions under which the law does hold and the difference between these conditions and the actual conditions. In dealing with economic principles it is likewise necessary to ask ourselves these three questions: (1) What are the conditions under which the principle is valid?

(2) How do these conditions differ from those of the actual case? (3) What are the practical consequences of these differences?

The large body of recognized economic laws has been developed for the conditions that exist in the idealized static state. Economic theory is very largely static theory. As will become clear as we proceed, the assumptions and conditions — and the conduct of people of the static state — are quite different from the conditions and the conduct of people in real life. While progress is being made, there is still no adequate theory — and it is quite likely that there never will be — that explains the conduct of actual people and the behavior of our complex production and marketing organizations. This is no criticism of the theory we do have. Without general principles and theories to guide us, economics would be reduced to confusing statistics and descriptive essays. But a better appreciation of the limitations of theory should lead to an appreciation of the difficulties that are encountered in applying economic theory to the conditions of our dynamic world.

These difficulties are increased tremendously when the explanation and application of economic principles are attempted within the limits of an elementary text. Only the simplest principles can be included; many extensions and refinements of static theory must be omitted. We must make the long and difficult jump involved in the application of theory to actual conditions as best we can. One important thing we will do. We will stress, and perhaps overstress, the significant differences between the conditions and assumptions of theory and the conditions of actual industry. And we will make it plain at all times whether we are assuming the conditions of the laboratory model of the static state or the conditions of actual industry.

The Static State and Perfect Competition. When Adam Smith and other eighteenth-century economists began to lay the foundations of an organized body of economic principles, the Industrial Revolution was just beginning in England, the influence of the merchant bankers was declining, the elaborate restrictions on trade by government and by state-granted monopolies were crumbling; a new spirit of individual freedom was developing.

The great contribution that Adam Smith and his successors made to progress was the impetus they gave to the idea that wealth is produced in greatest measure when free men are allowed to control their own economic affairs. The disadvantages of state and private monopoly were apparent from centuries of abuse of monopolistic power; the conditions for free and unrestricted competition were favorable. Manufacturing firms were small and growing rapidly in numbers. The manufacture of goods for sale in open markets instead of for specific customers was the rule. The factory output was sold to large numbers of independent wholesalers, jobbers, and exporters.

In the early development and growth of the factory system, capital appeared to be the most important factor. The factory system was looked on as a major change that lifted industry to a new, higher level of productivity, but it was not conceived as a continuing, growing system which required new kinds of technical management and ever-increasing investment of capital per worker. The importance of the dynamic factor of continuing improvements in manufacturing methods was not appreciated.

Under these conditions the open and free competitive market was adopted by the English economists as an ideal to strive for. It was not too dissimilar from the actual markets of the day; and assumptions to simplify the problems could be made without getting too far from reality.

The technical description of this model of a simple economy can be introduced conveniently by defining the conditions that are necessary for the existence of free and unlimited competition, or, as it is known in its most inclusive form, *perfect competition.*

Perfect competition covers conditions affecting the market, affecting products, and affecting production.

Perfect competition requires that there be a natural tendency in the society for the development of a large number of buyers and sellers. The most economical size of buying and selling units should be small compared with the size of the market. This implies a low rate of capital utilization per worker.

Under conditions of perfect competition there is no restraint placed on any person by any other person. Each person is free to choose his own course of action in his own best interest. Any buyer and any seller is free to enter the market. This agains implies a society in which the use of capital is relatively small.

Market information as to supply, demand, and prices is known to all buyers and sellers. There is no uncertainty as to market conditions. Under these conditions prices move without friction and without delay under the influence of nearby supply and nearby demand. No buyer is able by restricting his purchases to buy at a lower price than the market price, nor need he fear that his single demand will affect the price. No producer is able by restricting his output to obtain a higher price, nor need he reduce his price in order to increase his volume of sales. No seller can raise his price without sacrificing the whole of his sales; no buyer can lower his price and receive an offer. There is, consequently, only one ruling market price at a given time, although this ruling price may vary constantly from day to day under the influence of changing market supply or changing total demand.

There is no friction in the movement of goods, labor, or prices. There is perfect fluidity of prices to clear the market whether it be a market for commodities, for labor, or for capital. Whatever the supply, there will be sufficient demand to "clear the market" at some price.

Under these theoretical conditions of perfect competition, prices or wages or the rates of interest are determined entirely by short-term supply and demand. Cost of production has nothing to do with short-term prices and cost affects prices over the longer term only as cost of production affects supply. Over the longer term, if the open-market price falls below the costs of production, the highest cost producers will reduce their production or will disappear entirely. Supply will fall and price will rise.

The product must be completely standardized so that all producers in the same market sell exactly the same product without any difference in quality; without any brand name or trade-mark to distinguish it from competitors' products; without any difference in services connected with the sale or delivery of the product. There can be no reason under perfect competition why a buyer would prefer one producer's product over any other competing product. Buyers can have no preferences and sellers can offer no inducements to attract business. These severe conditions obviously are seldom, if ever, found in real life and are approached only in staple commodity markets like those for wheat and cotton.

Absence of Progress in the Static State. One of the major consequences of the assumptions that define the nature of the static state is the absence of change and uncertainty and consequently the absence of economic progress.

Under the conditions of perfect competition, as just defined, there can be no uncertainty. No person has any advantage of information or power over any other person. By inquiry and bargaining each person finds his own best position and he will not change this position to his own disadvantage. This results in a state of equilibium which is the normal condition of the static state. In this condition of equilibrium, every person receives the market value of his own services — no more and no less. Under these conditions the aggregate incomes of all the workers must equal total costs of the goods and services produced. Any surplus of income over costs implies an unbalanced condition that with complete fluidity cannot last.

It follows from these assumptions that there can be no change in the methods of production, no change in the tools or in the form of capital generally. In fact, it is assumed in the simplest form of the static state that the worker and his tools are an indivisible unit, that the only tools in use are hand tools owned by the individual worker.

There are no opportunities in the static state for investment in new forms of tools. Individual savings may be invested in individual hand tools. But all savings must be spent currently, or, more simply, all goods produced must be currently consumed. The absence of change and progress implicit in the static state is one of the assumptions that make the static state completely different from our American industry of continual change and impressive progress. It is a condition of the static state that is seldom stressed. At the same time, it is possibly the most important difference between the conditions of theory and practice.

Full Employment of Resources. It was mentioned that under the assumptions of the static state there can be no unemployment of available resources. There can be no long-continued mass unemployment. Production creates its own demand under the assumption that aggregate income from production equals aggregate market value of production, and that no person withholds his own goods or services from exchange in the open market. All goods coming to the open market will find a buyer at some price; goods will be exchanged for other goods or they will be consumed by the original producer; all available factors of production will find employment at some wage. This generalization is known as *Say's law of markets*, after the French economist Jean Baptiste Say (1767–1832). Say was the founder of the French classical school and was among the most eminent Continental disciples of Adam Smith. The English classical economist David Ricardo (1772–1823) stated Say's law of markets in these words:

> No man produces but with a view to consume or sell, and he never sells but with an intention to purchase some other commodity which may be useful to him or which may contribute to future production. By producing then, he necessarily becomes either a consumer of his own goods or the purchaser and consumer of the goods of some other person. . . . Productions are always bought by productions or by services; money is only the medium by which the change is effected.

This statement is completely valid under the assumptions of the static state and with the further understanding that in Ricardo's words, "No man produces but with a view to consume or sell" and to sell without delay. What Say's law overlooks, and what Ricardo did not include in his statement, is the important fact that goods may not be exchanged as soon as produced and that money incomes may not be spent as soon as received.

The Concept of Equilibrium. It should be evident from this discussion of the static state that a distinguishing characteristic of the static state is the unimpeded movement toward equilibrium. Its natural state is one of rest. There is a similar tendency toward equilibrium in the physical world. Water continues to flow until there is no difference of level; temperatures are equalized by the flow of heat from the bodies of higher temperature; differences of electric potentials cause currents to flow, as in the instantaneous discharges of natural lightning. These transitional changes in the physical world from one condition of equilibrium to another may be instantaneous, as with a lightning flash, or may take a long time, as with heat flow. In simple economic theory corresponding changes from one state of equilibrium to a different state are assumed to take place without time delay. But economists have also brought theory closer to reality by assuming slower changes over longer times during which economic forces tend to act but may not be strong enough to overcome opposing forces, and, consequently, may never bring about sustained equilibrium.

There is another condition necessary for sustained equilibrium that should be emphasized. No position or state of equilibrium is possible, either in the physical world or in the economic world, unless a balance of opposing forces occurs or unless the change destroys the force that caused the change. Wood will float in water — will reach a condition of sustained equilibrium — because opposing forces are balanced; iron will not float because the mass of the iron is greater than the mass of the displaced water — no equality of opposing forces can exist. Flowing water comes to a new state of equilibrium only when the change in water level eliminates the effect of gravity that caused the water to flow.

Similarly, balance or equilibrium is brought about in economic situations by the equalization of opposing forces or by the elimination of the unbalancing force as the system moves toward equilibrium. With a fixed supply of a commodity, the equilibrium price is reached because the price changes in a direction to bring the quantity demanded in balance with the fixed supply. Wage rates are equalized in a given labor market because labor moves from the lower paid employments to the higher when labor and wage rates are perfectly fluid. Production is increased or decreased by the single firm until a change in either direction increases production costs. If there is no point at which forces are equalized or reduced to zero, there will be no position of equilibrium.

If there is no such output with minimum cost, there will be no point of balance at which output will stop. There will be no point where the change (in output) eliminates the force producing the change (in this case, the reduction of costs). This common-sense principle or generalization gives importance to two principles of economics — the principle of diminishing utility and the principle of diminishng returns in production. These two principles will be discussed presently. But first it will be advisable to consider some other elementary concepts that will be encountered in later discussions.

The Concept of Value. Before goods will be exchanged — before a bargain will be reached — each party must see value in the goods or services he receives, and, after taking into consideration the possible differences in the needs and desires of the two parties, the values of the goods received and the goods given in exchange must be closely the same. The idea of value determined by the process of bargaining and exchange goes back to the unrecorded beginnings of civilization and for the individual to his earliest boyhood recollections when he traded marbles, pocketknives, stamps, or birds' eggs. Value as the economist defines it is the power which a thing has of commanding other things in exchange for itself. Value is an attribute of the goods and services; it is also a judgment of the mind.

The Two Aspects of Value. Some things have value because they are scarce. They may be scarce because they are difficult to find in the natural state or because they are costly to produce. Things that are valuable because they are scarce need not be useful. Such things have "intrinsic value" because their value is an inherent property of the commodity. Gold used as currency has this kind of intrinsic value.

There is another kind of value which depends on the use of the thing, on its utility, on its "value in use." An ounce of gold is commonly considered more valuable than an ounce of bread, but bread obviously has more total utility to consumers than gold. But an ounce of bread has less value in exchange because it is relatively cheap to produce.

The Concepts of Value and Price. The price of any commodity or service is its value measured in money. Price is determined by value in exchange and value in use; by the cost or scarcity value; and by the power of the commodity to satisfy the wants of the buyer — by its utility.

Alfred Marshall (1842–1924) called value the keystone of the arch, the two supporting sides of which are supply and demand. He also described value as a pair of scissors, each of whose blades (supply and demand) is essential to the other.

Much of the discussion concerning value is directed to the reconciliation of the two major aspects of value: utility to the user that influences the consumer's demand for goods, and scarcity and costs of production that greatly influence the supply of goods. For many farm commodities utility and natural scarcity are the controlling factors that determine price. Over the short run, costs of production for these commodities have little or nothing to do with price determination. For most manufactured goods, on the other hand, supply is independent of the weather and is more completely under control. For manufactured goods supply is deliberately adjusted to meet the estimated or actual demand. But in a wealthy economy neither the farmer nor the manufacturer can predict, much less control, demand. It is important to remember that both of these aspects of value — utility and scarcity — exist and that one or the other is more important as the determinant of price, depending on conditions in the particular case.

The Marginal Concept. One of the more difficult concepts that economists use widely to explain value, cost, and price relationships at equilibrium in the static state is the concept of *marginal* quantities and attributes as distinguished from *average* or total quantities or attributes. Average utility, for example, involves the familiar and easily understood concept of the arithmetical average of the total utility involved. Marginal utility, on the other hand, is the isolated utility of an additional unit, of the last unit wanted. Marginal analysis is always concerned with the effects of an additional unit. Marginal utility is the utility of the final unit that a person will choose; marginal cost is the added cost of the final unit of output in a factory; marginal revenue is the additional income received for the final unit that can be sold. Thus, it is helpful in this elementary application of the marginal concept to translate "marginal" into "additional" — to think of the marginal unit as the final additional unit.

Jevons, the English economist, coined the phrase "final degree of utility" for the utility of the last unit "at the margin," which is perhaps a more easily understood designation.

The Principle of Diminishing Utility. The earliest application of the marginal concept was in respect to utility which, in an economic sense, is the power of things to satisfy conscious wants.

It is general experience that as any want is satisfied relatively to other wants, the want diminishes in intensity. This common experience is the basis of the principle of diminishing utility. We will make no application of the principle of diminishing utility except to point out the necessary association of diminishing utility in the application of the marginal concept as a condition for equilibrium. Unless the relative intensity of wants does diminish as additional units of the specific goods are acquired, there can be no final unit and no balancing of forces to produce a state of equilibrium. A crude illustration is the miser's desire for gold. There is no diminishing utility for miser's gold; no marginal unit and no state of equilibrium.

The Principle of Diminishing Returns. The principle of diminishing utility concerns the satisfaction of people's wants. It concerns people's choices and satisfactions. It is psychological in nature.

A similar principle that operates in the technological or physical field of production is the principle of diminishing returns. The utility of successive units of a commodity declines in intensity as more and more units are acquired. Similarly, in the field of production the use of more and more units of one factor of production — labor, for example — with other factors and other conditions held constant — will at first produce a proportionately larger increase in output, but as the process is continued, the additional units of output related to each additional unit of labor gradually decline, until, finally, additional units of labor produce no additional output at all. In this field of production the *marginal unit of an agent of production*, such as labor, is the least productive additional unit in this series that is actually worth using. The *marginal product* is the additional output produced by the final unit of input. In this technical language equilibrium in production is reached when *marginal cost* is equal to *marginal revenue*.

Here again it should be noticed that the existence of the marginal unit and the possibility of equilibrium depend on the operation of the principle of diminishing returns. Unless at some point in the process there is a final unit beyond which it will not be profitable to employ additional units, there will be no marginal unit. There is no stopping place and no position of equilibrium, just as there is no stopping place in the true miser's desire for gold or money. This dependence of the final unit of input — the marginal unit — on diminishing returns from additional units of input will be found to have considerable practical importance in the application of the marginal analysis to actual situations and it will be discussed at length in later chapters.

A few simple illustrations will help in the understanding of the important principle of diminishing returns. Land, for example, may be cultivated intensively by using large numbers of workers on each acre of land. As the number of workers is increased, the output per acre may be increased, but only at the expense of less and less additional output for each additional man. Or with land plentiful and labor scarce, a farmer may try to cultivate more and more land. Up to a certain point the output per acre, as well as total output, may increase; but beyond some point the farmer's labor becomes less and less effective when spread over too many acres, and each additional acre put under cultivation adds less and less output to the total. Then as a third example, the farmer, overburdened by too much land, may bring capital to his rescue. By holding the amount of land and the amount of labor constant, output can be increased by additional units of capital in the form of power machinery. But additional units of capital of the *same form* soon reach their most economical proportions, and the added units of capital produce smaller and smaller additions to output, and finally none at all.

As we shall find, difficulties are encountered when the principle of diminishing returns is applied to specific problems. It is advisable, even in this introductory discussion, to stress some of the limitations of the principle. They will be more apparent when specific applications of the principle are described in Chaps. 5 and 6.

The principle can be readily applied to land or labor as the variable factor, because it is realistic to assume that more and more land or more and more labor can be used *without change of form*. Also, land and labor are continuously divisible into units of the same form. This assumption of continuous divisibility is much less realistic when capital is the variable factor. The use of more and more capital per worker is the most significant development in American industry, but the capital must be changed in form to be effective. One worker can use only one hand shovel, but he can use a shovel and a wheelbarrow or he can use a power-driven shovel or a power-driven truck without experiencing diminishing returns for each additional unit of investment, assuming that the added units of investment are in an effective form. The principle of diminishing returns may not apply if the form of the additional units of capital is changed. The principle of diminishing returns also assumes that only one factor will be changed while all other factors are held constant. In practical industry, production units are not usually units made up of single workers each with his own hand tools as with a pick-and-shovel gang. Production units are usually major power tools, each with its necessary complement of specialized workers. Or the production unit may be a machine line, a bench assembly line (for small work), or a floor assembly line for large equipment. Such units are not minutely and continuously divisible, and are not, as a rule, subject to the principle of diminishing returns. In practice, a factory unit is designed with equipment for a specific output based on one shift and for 5 or more days a week. Output may be changed without departing from this most efficient proportion of labor and capital by working more shifts and more days, or by working one shift 3 or 4 days a week. There are other limitations of the principle of diminishing returns that will be described in later chapters.

The principle of diminishing returns has important applications in the analysis of the operations of the single firm (Chap. 5) and in the development of the static theory of wages (Chap. 6). It is important, therefore, that the assumptions and characteristics of the static state be kept in mind — as we shall try to do — when these applications of the principle of diminishing returns are discussed.

Summary

The development of principles and generalizations of theory is facilitated in economics, as in the physical sciences, by simplifying and idealizing conditions with the aim of studying the behavior of one factor or condition at a time. The economists have developed for this purpose the laboratory model of the static state and of perfect competition.

Because the assumed conditions of this laboratory model differ in important respects from the conditions of actual industry, it is necessary to keep in mind three questions before economic principles (applying to the static state and to the conditions of perfect competition) can be safely applied to actual industry. These questions are:

1. What are the conditions under which a given principle is valid?
2. How do these conditions differ from those of the actual case?
3. What are the practical consequences of these differences?

It is important, then, in starting the study of economic principles to understand the conditions under which they are valid and the differences between these conditions and the more familiar conditions of actual industry.

The economists' model of perfect competition in the static state covers conditions affecting the market, affecting the product, and affecting the process of production.

It is assumed that the *market* consists of a large number of buyers and sellers in which any buyer and any seller is free to enter the market. Complete information concerning supply, demand, and price is available to all buyers and sellers. There is no uncertainty. There are no frictions and no restrictions in the movement of goods or labor to or from the market or in the movement of prices or wage rates.

It is assumed that *products* are completely standardized. All producers in the same market offer exactly the same product: without any difference (real or merely claimed) that distinguishes one seller's product from another; and without any differences in services connected with the sale or delivery of the product. There is no reason why a buyer would prefer one producer's product over any other competing product of the same kind.

Under the conditions of perfect competition, as just defined, there can be no uncertainty and no unknown risks in the market. Under this condition, and in the normal condition of equilibrium, no one can be paid more than the current exchange value of his own labor or invested capital. There can be no surplus and no true profit; there are no changes in methods of production. There can be no economic progress.

Under these assumptions and related conditions, production creates its own demand. Everything produced can be sold at some price; everyone can be employed at a wage that is determined by the supply of labor and its exchange value. There is full employment of available resources; there can be no unemployment of labor unless the society is in transition from one state of equilibrium to another. This is Say's law of markets.

In the static state, stable equilibrium is the natural state. Any change in conditions that disturbs the existing equilibrium immediately sets up forces that produce a new state of equilibrium. A state of stable equilibrium in the physical world, as well as in the economic world, requires that there be a balance of opposing forces or that the disturbing force be reduced to zero. For example, flowing water reaches a new equilibrium — a new level — only when the flow produces a new level that balances the effects of gravity. In economics, this equalization of forces is produced by the balancing of supply and demand in the field of prices, and of two additional principles that are introduced in this chapter: the effects of the principle of *diminishing utility,* in the case of exchange of commodities, and of the principle of *diminishing returns* in production.

The principle of *diminishing utility* concerns the satisfaction of people's wants. It is a common experience that as any want is satisfied in relation to other wants, the want diminishes in intensity. This is the principle of diminishing utility.

The principle of *diminishing returns* concerns the diminishing output or product produced by additional small units of input — labor or capital. In the field of production the use of more and more units of one factor of production — labor, for example (with other factors and conditions held constant) will at first produce a proportionately larger output. But as the process is continued, the additional unit of output related to each succeeding additional unit of input gradually declines. This is the principle of diminishing returns.

It is important to note that unless the principle of diminishing returns operates in a particular production situation no position of equilibrium will be reached. In production equilibrium is reached under the assumed conditions of the static state when the last unit of input produces a unit of output of the same value. Until this point of balance is reached, it will be profitable to add more units of input (labor, for example). When this position of equilibrium is reached, more units of input will produce less output and will result in loss. The last unit of input is the *marginal unit* (of an agent of production). The *marginal product* is the additional output produced by the final unit of input, and the value of this final unit of input is the *marginal revenue*. In this technical language, equilibrium in production is reached when *marginal cost* is equal to *marginal revenue*.

Review Questions

1. Give one or more general reasons for popular skepticism concerning the validity of economic laws; also why the blind application of economic laws to practical situations may be discredited by results. Do these difficulties really discredit elementary economic theory?

2. What three questions should be asked and answered before an elementary economic principle is used to explain the probable result of a change in prices or a change in wages in actual industry?

3. What major assumptions are made by the economic theorist in setting up the conditions under which elementary static theory is valid?

4. What major assumptions are involved in the concept of perfect competition?

5. What do you consider the most important difference between the conditions of the static state and conditions in present-day American industry?

6. Why is Say's law of markets valid under conditions of the static state, but may lead to wrong conclusions if applied to actual industry?

7. What general conditions are necessary for the attainment of sustained equilibrium in either the physical or economic fields?

8. What is a general distinction between average quantities and marginal quantities?

9. What general conditions are necessary for the principle of diminishing returns to operate? Does the long-term increase in mechanical power per person in the United States (refer to Table 2 • 6 of Chap. 2, page 34) provide an example of the operation of the principle of diminishing returns? Give reasons for your answer.

10. Why is the principle of diminishing returns a necessary factor in the marginal analysis of production costs and outputs? Can stable equilibrium be attained in a specific case if the principle of diminishing returns does not apply in that case?

11. Do you think that the conditions of perfect competition, as they affect markets, products, and production, should be held up as an ideal to be approached in our actual system of private capitalism or that our Federal laws and public policy should aim to establish the conditions of perfect competition in actual industry?

4. SUPPLY AND DEMAND

The general purpose of our studies is to understand the mechanism and the operations of the American economic system. We are now ready to begin this interesting task. It is sensible to begin with the simplest kind of operation, and this is the exchange of goods in a perfect competitive market where price alone determines the demand for goods and the supply of goods that will come to market. In this chapter we will be concerned only with the exchange of goods; the more complicated problems connected with production will be reserved for the next chapter. The open public markets or fairs in England and the Continent during the Middle Ages may be taken as the nearest actual situation to the one we will study.

To make the problem still simpler, we will assume that the public market follows the rules of perfect competition as defined in the preceding chapter. We will also assume that money is used only as a simple medium of exchange and does not change its value. A later chapter will explain the more complicated situation when money itself changes value and, in that way, changes the general price level.

The Law of Supply and Demand. A century ago economists formulated the important relationship between demand and supply on one side and price on the other in this way:

The quantity of goods demanded varies inversely with the price and the quantity supplied varies directly with the price.

More searching analysis shows that this is an inadequate statement. The *quantity demanded* and the *quantity supplied* both depend on price. The quantity demanded declines as price increases and the quantity supplied increases with increasing prices. In mathematical terms demand and supply are both functions of price. It is necessary to establish the way quantity demanded varies with price (under the stipulated conditions) and the way the quantity supplied varies with price before the law of supply and demand can be stated accurately.

The way the quantity demanded varies with price is called the demand function, the demand schedule, or the demand curve. The *demand schedule* is the several amounts of the product that the market will take at a series of prices.

Theoretical demand is a schedule of quantities taken at a series of prices under the specified constant conditions and under perfect competition. *Demand,* consequently, is not a single quantity taken at one price, as the old statement of the law inferred, but is the entire schedule or series of quantities taken at a series of prices. A change in demand implies a change in the entire schedule. A single demand schedule applies to a specific time so short that it is reasonable to expect other conditions will remain constant. Thus, in theory it is assumed that changes in quantities demanded according to a single demand schedule respond instantaneously to changes in price.

Demand is usually shown graphically as a straight line or curve having a downward slope toward the right-hand side of the chart. Experience in actual markets shows that an increase in price usually decreases demand or consumption and that a decrease in price usually increases demand or consumption. There are a few exceptions to this general experience, but they are of minor importance. At high price the quantity demanded is small, and as the prices decrease, the quantities taken increase. In markets of perfect competition the law of supply and demand needs no qualification.

Similarly, the way the quantity offered or supplied varies with price is the supply schedule; this defines the amounts of the product that a market will offer for sale at a series of prices.

Demand arises from consumers' needs and desires. Supply, on the contrary, is associated with production unless supply is limited to nearby existing stocks of goods. Supply is as tangible as demand is intangible. When it is said, as it often is, that we have solved the problems of production but have failed to solve the problems of distribution of the goods produced, we are merely saying that we know much more about the physical problems of production — of controlling or stimulating supply — than we do about controlling or stimulating demand.

Another popular misconception of the law of supply and demand is implicit in the statement frequently made during the reconversion period following the Second World War: Wartime price controls and rent control should be continued in force until increased supply balances demand. Supply and demand will balance at some set price only if the available supply of goods can be made equal to the quantity of goods demanded at the established price. If, however, the supply of goods is limited — as housing was limited during the early postwar years — and the price or rent established by government edict is lower than the equilibrium price at the available supply — then the quantity demanded will exceed the available supply. There can be no balance.

How Price Is Determined. Because the quantity demanded increases when price is lowered, and because the quantity supplied decreases under the same price condition, there will always be a price at which demand and supply are equal, remembering that we are dealing with a perfect market in which the volumes of goods supplied and goods demanded move freely in response to price, and in which prices can go as high as required or as low as may be necessary to cause the demand curve and the supply curve to intersect. If the demand schedule and the supply schedule are plotted to the same price and output scales, the price established by a given demand schedule and a given supply schedule will be the price at which the two schedules cross. This is the equilibrium price at which it is commonly said supply and demand are in balance.

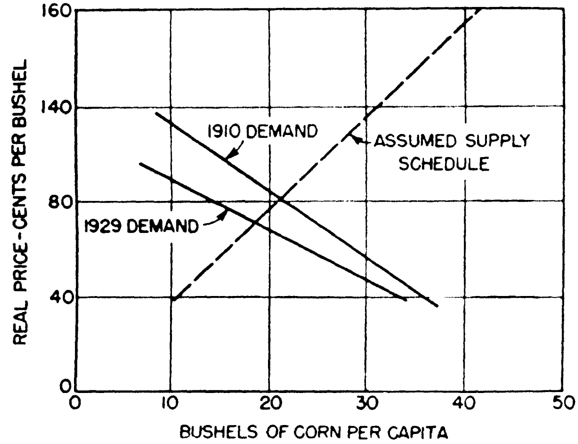

Fig. 4 • 1. Equilibrium Price with an Increase in Demand

When the demand schedule declines and the supply schedule does not change, the equilibrium price declines. When supply is nearly fixed—cannot be increased—a downward shift in the demand schedule results in a still larger price decline.

Two different demand curves and one supply curve are shown in Fig. 4 • 1. These demand curves are the calculated demand curves for corn for the two years 1910 and 1929.[1] The supply curve is assumed to show the way supply from existing stocks of corn will appear in the public market at different prices. The equilibrium price in each case is at the intersection of the demand curves and the single supply curve. The equilibrium price with 1910 demand is 80 cents a bushel. The demand schedule shifted downward over the period from 1910 to 1929 and the equilibrium price in 1929 is 70 cents (assuming no change in the supply schedule).

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[1] See p. 70 and Fig. 4 • 5 for discussion of the demand schedules for corn from which these two demand schedules were selected.

Figure 4 • 1 shows that a downward shift in demand schedule with no change in the supply schedule results in a decrease in the equilibrium price. Figure 4 • 1 can also be used to show the decrease in equilibrium price if supply is fixed. In this case the supply schedule for a given crop year or other period is a vertical line — price cannot affect the fixed supply. For example, if the vertical supply schedule is assumed to be 20 bushels per capita for both 1910 and 1929, the equilibrium price in 1910 would be about 85 cents and in 1929 it would be about 67 cents. If the crop were 20 bushels per capita in 1910 and 30 bushels per capita in 1929, the equilibrium prices would be 85 cents in 1910 (as before) and about 44 cents in 1929.

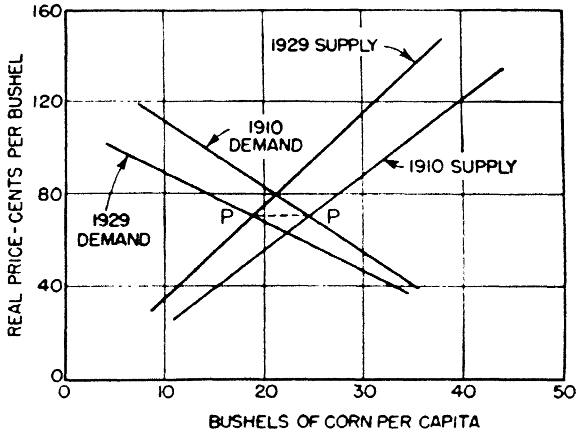

Fig. 4 • 2. Constant Equilibrium Price Maintained by Changes in Demand and Supply
When the supply schedule shifts to the right, the supply of a commodity is increased at a given equilibrium price. With no change in demand schedule, the equilibrium price declines. When the supply schedule shifts to the left (to decrease supply at a given price) and there is a simultaneous shift in demand schedule in the same direction (to decrease demand at a given price), the effects on equilibrium price are opposite and may exactly cancel (see *PP*).

A larger supply and a smaller demand produces a double reduction in the equilibrium price.

In the spring of 1947 the U.S. government entered the wheat market to buy wheat for export. Near the end of the crop year the supply schedule of the U.S. wheat market was virtually fixed. Total supply could not be increased short of another harvest. The U.S. demand for wheat for export to Europe constituted a change in the demand schedule. The average cash price of wheat at Kansas City increased from $2.07 a bushel in December, 1946, to $2.69 a bushel in March, 1947.

It is possible to imagine a change in both demand and supply schedules such that the two changes compensate for each other with the result that there is no change in price with an increase in production and consumption. This condition is shown in Fig. 4 • 2 which is the same as Fig. 4 • 1 with a second imaginary supply schedule added. The 1929 supply is arbitrarily reduced to match the reduced 1929 demand. The result is that the two equilibrium prices, *PP,* are the same.

The Nature of Demand. In the preceding discussion the demand and supply schedules are those that would exist under perfect competition when price is the only factor that influences supply or demand.

Actual demand in real markets is the result of many factors of which price is only one, and sometimes a relatively unimportant one. Because of this situation we know very little about the shape of the theoretical demand schedules we have been discussing. Economists have attempted to determine theoretical demand schedules for farm commodities and for a few manufactured products by starting with actual market prices and quantities and by making corrections to eliminate, as completely as practicable, the effect of all factors other than price. Such corrected demand schedules based on empirical data are known as *statistical demand schedules.* Demand schedules derived from the raw, uncorrected market prices and quantities are called *actual demand schedules.* Typical examples of statistical demand schedules and actual demand schedules will be shown presently.

Actual Demand. Actual demand of a commodity in actual markets is measured by the total quantities of the commodity that can be exchanged or sold or consumed within some specific period of time and under the complex of conditions as they exist in the actual market.

Even in the case of staple foods, where actual demand is least affected by conditions other than price, and where actual markets more nearly approach the conditions of pure competition, actual demand is affected by many other conditions than price. Professor Henry Schultz, an authority in this field, has pointed out eight factors that are important in determining the actual demand for corn, ranging from such obvious things as the price of corn and the general price level to other less familiar factors such as the price of pork and the state of general business.

When manufactured goods are considered, a different set of factors is found to apply to each industry and product. Price may be much less important than other conditions. The demand for electric incandescent lamps, for example, depends only slightly on the price of lamps and on general business conditions and depends much more on such special industry conditions as the number of wired homes, farms, business and industrial establishments in which incandescent lamps can be used, on the cost of electricity, and on the education of consumers to the advantages of high intensities of illumination.

Demand for manufactured products also changes with time under the influence of new products and new habits. The development of the automobile industry changed demand for steel, for rubber, for glass, for textiles, and for a host of other materials and products. Consumers must usually be educated through advertising and sales-promotion campaigns to the utility of a new product and to new habits and customs. The demand for Coca-Cola, for example, increased from a few hundred gallons of syrup to hundreds of millions of gallons, over a period of 70 years, and spread throughout the world without a significant change in price.

The art of market research recognizes an ultimate market demand or condition of market saturation that will be reached by a product at a given price only after decades of sales promotion and advertising. It is necessary to distinguish between demand influenced by price alone and demand in actual markets where "quantities taken" at a lower price frequently increase principally because the lower price opens up a wider market. In this case demand is created by the lower ratio of price to average income. There is, for example, only a small market and limited demand for houses in the price class above $30,000; following the Second World War there was a very large unsatisfied demand for houses that could be priced under $15,000. Before the Second World War the electric dishwasher for home use, at a price of $300, never succeeded in developing a worth-while market, but with increasing scarcity of domestic workers, the demand for high-cost dishwashers increased significantly. The electric refrigerator industry started in 1921 on a very small scale after years of laboratory and factory development. In 1920, 5,000 refrigerators were sold at an average retail price of $550. In 1941, 3,500,000 refrigerators were marketed at an average retail price of $155. Undoubtedly the lower price was an important factor in increasing sales 700 times.

Demand is partly a state of mind and its measurement and its prediction are indeed difficult. The uncertainties concerning the effects of price and other factors on demand and the impossibility of predicting what is going to happen to future demand constitute one of the principal hazards of business.

Difficulties of forecasting over-all demand and the demands for specific products increase as an economy becomes wealthier and average incomes increase above those required for absolute necessities. It becomes more difficult to gauge the consumer's mind as the opportunities for choice and selection increase with increasing free income. This problem does not exist in economies that are on a bare subsistence level, and in no country are these uncertainties and business risks greater than they are in the United States.

The Demand for Incandescent Lamps. The price and sales history of incandescent lamps provides a good example of an actual demand schedule for a manufactured product. This example will bring out the many specific factors that influence demand and the complicated nature of the actual demand schedule.

Figure 4 • 3 and Table 4 • 1 show the list prices of incandescent lamps and the number of units sold by all manufacturers in the United States over the past 20-odd years.

It is the opinion of those familiar with the lamp industry that the considerable reduction in average prices that has been made over the past 26 years has played only a minor part in the 4:1 growth in sales that has developed over the period. Other factors have been more important than the first cost of the lamp. The over-all cost of light depends on three major things: (1) the cost of the electricity to operate the lamp; (2) the efficiency of the lamp in converting electrical energy into light; and (3) the cost of the lamp itself. The relative importance of these three elements is shown by the figures of Table 4 • 2.

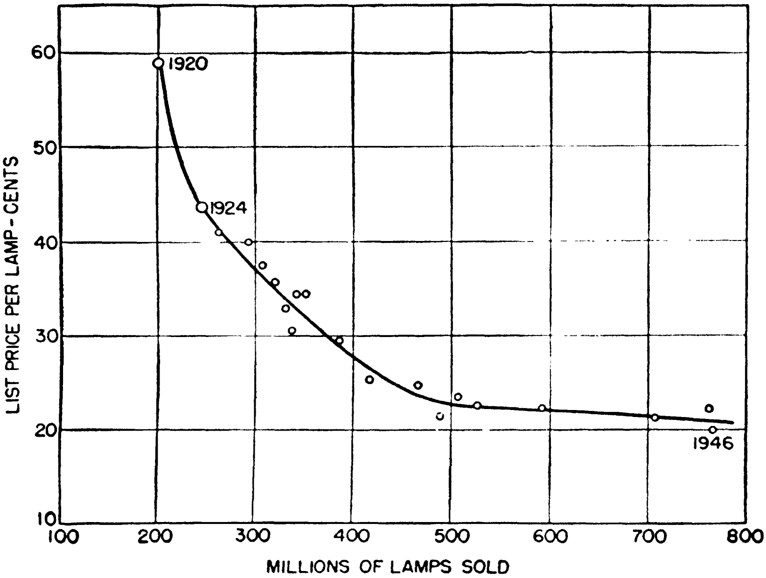

Fig. 4 • 3. Price-demand Relation—Large Incandescent Lamps

Over the period of 26 years, shown in the chart, annual sales of incandescent lamps increased from 200 million to nearly 800 million. The average price declined from about 60 cents to 22 cents. This historical record is an actual demand schedule which has been established over a long term of years and under many changes in conditions—other than price—that have influenced demand.

Each dot on the chart should be associated with a different theoretical demand schedule.

In any year since 1927 it would have required a reduction of 20 per cent in the cost of the lamp to cause a 1 per cent reduction in the cost of light. Obviously, the cost of the lamp bulb would be only a minor factor in influencing the consumer to increase or decrease his demand for lamps.

The factors that have been more important in enlarging demand should be measured in terms of the increasing use of electricity for lighting. Over

Table 4·1. Demand for Incandescent Lamps since 1920

Year	Average list price	Number of units sold, millions of lamps
1920	$0.5964	200
1924	0.4380	252
1925	0.4135	264
1926	0.3991	294
1927	0.3776	305
1928	0.3556	312
1929	0.3457	349
1930	0.3445	341
1931	0.3439	347
1932	0.3234	335
1933	0 2997	339
1934	0.2990	380
1935	0.2584	413
1936	0.2428	462
1937	0.2331	507
1938	0.2189	487
1939	0.2229	529
1940	0.2241	588
1941	0.2187	705
1942	0.2225	761
1943	0.1993	767
1944	0.2121	809
1945	0.2243	764
1946	0 2232	770

the past 30 years the electricity used per capita in the United States has multiplied almost nine times—from 50 kilowatt-hours per person in 1915 to 446 kilowatt-hours in 1946. This prolific growth has been the result of (1) the declining cost of electric energy and the cost of producing light, and (2) the better appreciation of the utility of high-intensity lighting—of

Table 4·2. Cost of Light during 40 Years—Based on Operation of 60-watt Lamp—1,000 Hours' Life

	1907	1917	1927	1937	1947
Efficiency of lamp (lumens per watt)	7.9	9.4	11.2	13.8	13.9
Efficiency (1907 = 100)	100	119	142	175	176
Power cost per kilowatt-hour	$0.105	$0.0752	$0.0682	$0.0430	$0.0325
Total power cost (1,000 hours)	$5.93	$4.25	$4.02	$2.55	$1.92
Lamp list price	$1.75	$0.36	$0.25	$0.15	$0.11
Lamp and power cost	$7.68	$4.61	$4.27	$2.70	$2.03
Ratio lamp cost to total cost	0.23	0.08	0.058	0.055	0.054

more illumination—by industrial, commercial, and home users. The first of these two factors is the result of technological advances throughout the electrical manufacturing and electric utility industries. The second factor is the result of advertising and promotion of better illumination by all agencies within the electrical industry.

Statistical Demand Schedules of Farm Products. Farm products offer the best field for the study of theoretical demand. Markets for farm products approach much more closely the assumptions of pure competition than do markets for manufactured products. Farm products are marketed in world markets in which prices move freely and the other conditions of pure competition are more nearly realized than in markets for manufactured goods. Better statistics of related prices and quantities consumed and with a wide range of small changes are available through the operations of the commodity exchanges and the statistical reports of the Department of Agriculture.

An authoritative study of theoretical demand schedules of farm products was made by Professor Henry Schultz of the University of Chicago.[2] Professor Schultz calculated the demand schedules of a number of staple farm commodities such as sugar, hay, wheat, corn, and other grains, and found, even for these relatively simple examples, that measurement of theoretical demand was none too easy. For a number of the commodities studied, available statistics were incomplete or of questionable accuracy. In each case it was found necessary to analyze production, marketing, and consumption conditions and habits. It is possible to use statistics that extend over a long series of years for a theoretical demand schedule (independent of time) only where the market for the commodity is thoroughly developed and where a routine behavior of consumers exists and where the available statistics of consumption are such as to reflect this routine behavior. In the case of sugar, for example, actual statistics show a consumption of 40.3 pounds per capita in 1875 and a consumption of 107.5 pounds per capita in 1925. Obviously consumption habits changed over these 50 years—possibly due to an increased consumption of sugar in candy and in soft drinks. Then, after 1929, this increasing trend in consumption apparently reversed. The effect of these changing habits on demand had to be taken into account before a satisfactory demand schedule could be obtained. Professor Schultz calculated a different demand schedule for each year, six of which are shown in Fig. 4·4 for selected years. By 1920 the increase in consumption of sugar as a function of time had stopped.

These demand schedules are statistical demand schedules showing short-time relationships between consumption and price, with the effects of all factors other than price eliminated as completely as the available information permits.

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[2] SCHULTZ, HENRY, "The Theory and Measurement of Demand," University of Chicago Press, Chicago, 1938.

The demand schedule for corn also illustrates the many factors other than its own price that affect demand for this staple food and industrial raw material. Professor Schultz lists eight factors that he found to be important:

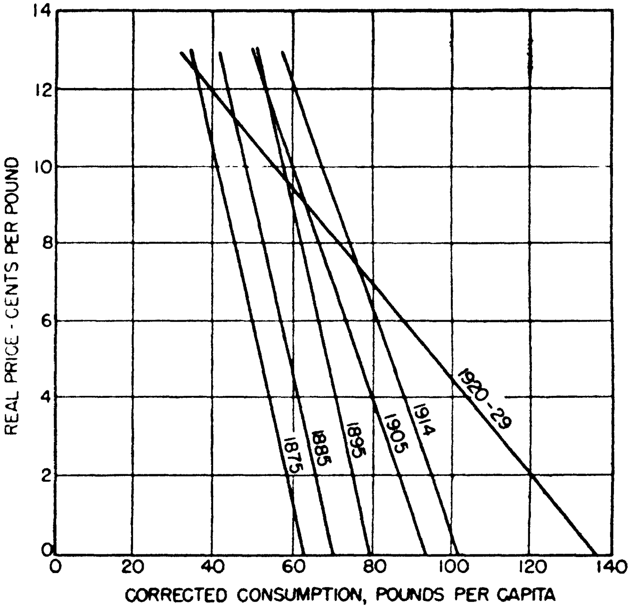

Fig. 4 • 4. Demand Schedules for Sugar

These demand schedules for sugar represent an attempt to calculate theoretical schedules (influenced by price only) from actual schedules. They are statistical demand schedules. They show an increase in demand (at a given price) from 1875 to 1914. From 1914 to 1920 there was a decline in demand at high prices and a further increase in demand at low prices.

1. The size and economic status of the population;
2. The price of corn for the same crop year;
3. The general price level;
4. The prices of other cereals;
5. General business conditions;
6. The amount of corn fed to domestic animals;
7. The prices of these animals;
8. Other factors that change slowly with time, such as the changing eating habits of consumers and new industrial uses of corn.

Figure 4 • 5 is the demand curve for corn calculated by Professor Schultz for three selected years.

Elasticity of Demand. The quantity of a product that consumers demand usually increases as price is lowered, but this relation between price and quantity—the demand schedule—varies widely with different products and may vary for the same product at different price ranges. Established national, community, or individual habits and customs have a great deal to do with it. Necessities, such as the more common items of food and clothing, are bought in about the same quantities with fairly wide changes in prices.

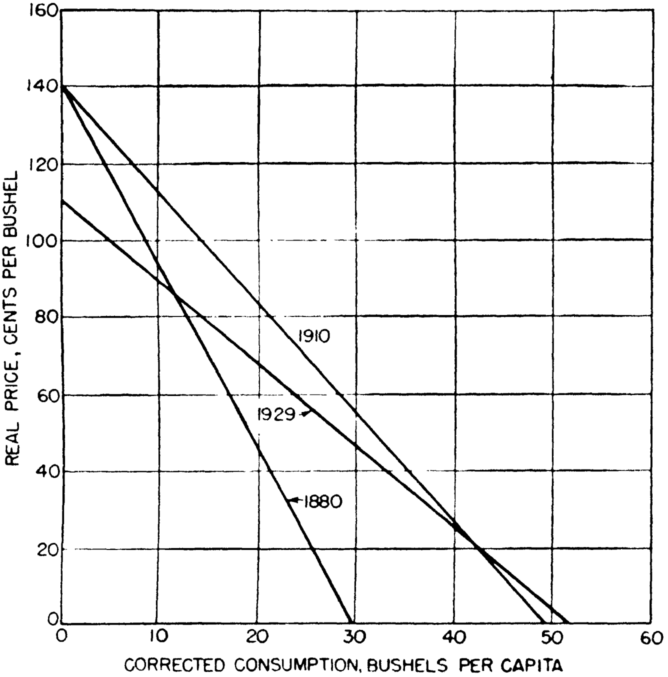

Fig. 4 • 5. Demand Schedules for Corn

These demand schedules for corn are statistical demand schedules, based on actual schedules, but corrected to eliminate (as completely as practicable) all influences on demand except price. The three lines of the chart show changes in demand schedule for the three years.

Sales of products having less utility, including new manufactured products of the more durable kind, are usually more responsive to a change in price.

These different responses to change in price are known as different "price elasticities of demand," or, more simply, "elasticity of demand." We say a particular demand schedule is *highly elastic* if a small change in price results in a large change in the quantity demanded. On the other hand, a demand schedule is said to be inelastic if the quantity demanded responds very little to a change in price.

A demand schedule which can be plotted as a straight line (as in sugar and corn) has different elasticities at different price levels. Elasticity of demand varies from point to point, its value being higher for high prices (or low consumption) than for low prices (or high consumption).

A demand schedule that has the same elasticity of demand at all prices has the shape of a curve by which equal per cent changes in price result in proportional changes in the quantity demanded. Thus, if the demand schedule is such that at all prices a 1 per cent reduction in price results in a 2 per cent increase in quantity demanded, the constant elasticity of demand is two. If the rate of decrease in price is equal to the rate of increase in quantity demanded, the elasticity of demand is unity. (A demand schedule for automobiles having a constant elasticity of two is used in Chap. 8.[3])

Elasticity of demand may be defined generally and accurately as the ratio of the relative change in quantity demanded to the relative change in price when the relative changes are infinitesimal. For a demand schedule that can be represented by a straight line, approximate elasticities can be calculated arithmetically by using small changes in price—say, 1 per cent.

For purposes of illustration the simple arithmetical method will be applied to the straight-line schedule for sugar, Fig. 4 · 4.

Example 1. Elasticity of demand at 13 cents and for 1875 demand schedule.

At 13 cents quantity consumed is 33.4 pounds.

At 12.87 cents (1 per cent less) quantity consumed is 33.686 pounds.

These quantities are calculated by use of the equation of the demand schedule ($x = 62 - 2.2y$).

For 1 per cent decrease in price consumption increased 0.85 of 1 per cent

$$\frac{(33.686 - 33.4)}{33.4}.$$

Therefore, elasticity of demand at 13 cents is 0.85.

At this price the 1875 demand schedule is inelastic; the elasticity of demand is less than unity. For the seller of sugar a deliberate reduction in price below 13 cents made for the purpose of increasing consumption of sugar would have resulted in reduced total revenue.

Example 2. Elasticity of demand at 4 cents and for 1875 demand schedule:

At 4 cents quantity consumed is 53.2 pounds.

At 3.96 cents quantity consumed is 53.288 pounds.

One per cent reduction in price results in 0.146 of 1 per cent increase in consumption. The elasticity of demand at a low price is lower that at a high price.

Example 3. Elasticity of demand at 13 cents and for 1929 demand schedule:

At 13 cents quantity consumed is 32 pounds.

At 12.87 cents quantity consumed is 33.04 pounds.

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[3] Refer to p. 159 and Fig. 8 · 1.

One per cent reduction in price results in 3.25 per cent increase in consumption. Elasticity is 3.25. At this price level the 1929 demand schedule is highly elastic. In 1929 a reduction in price from the 13-cent level would have considerably increased total revenue of the seller.

Example 4. Elasticity of demand at 4 cents and for 1929 demand schedule:

At 4 cents quantity consumed is 104 pounds.

At 3.96 cents quantity consumed is 104.32 pounds.

One per cent decrease in price results in 0.308 of 1 per cent increase in consumption. At this price the 1929 demand schedule is inelastic.

By trial it was found that the demand elasticity was unity at a price of 8.5 cents. At this price, 1 per cent decrease in price results in just 1 per cent increase in consumption. The average actual price in 1929 was between 3 and 4 cents. Throughout the entire period studied (1875–1929) the demand schedules were inelastic in the actual price range.

It is interesting to note several facts of economic importance to the sugar industry that came out of Professor Schultz's studies. Following the inflated sugar prices of the First World War, there was a drop in the real price of sugar (a drop greater than the drop in all wholesale prices) that was generally ascribed to conditions of supply, such as the increase in sugar production by nations that wished to be self-sufficient. Added to these disturbing supply conditions, there was a trend toward lower consumption per capita that started in the early 1920's. Prior to 1914 there had been a strong rising trend in demand that had helped the industry. Added to the declining trend in demand, the inelasticity of demand made the financial problems of the industry still more difficult. Because of these inherent problems and the added price collapse caused by the 1930 depression, Congress passed a Sugar Control Act to limit production in the United States and to establish a quota for sugar imports. These legislative remedies did not touch the inherent problems associated with demand, and by curtailing supply, contributed greatly to the sugar shortage during and following the Second World War.

Professor Schultz found similar demand conditions in the major staple farm commodities he studied. In the case of corn, he found a downward shift in demand since the First World War and an increasing inelasticity. The net effect of a 1 per cent *increase* in price was to decrease consumption by approximately 0.8 per cent during the period 1879–1895; by 0.7 per cent in 1896–1914; and by 0.5 per cent in the period 1915–1929. During all three periods a large crop was worth less than a small crop within limits.

The elasticity of demand for cotton declined even more over the years. The effect of an increase of 1 per cent in real price was to decrease annual per capita consumption by approximately 0.51 in the period 1875–1895; by 0.25 per cent in 1896–1913; and by 0.12 per cent in the period 1914–1929.

During the first two periods annual consumption per capita (at constant price) increased. The demand schedules shifted to the right. But during the third period (and to a greater extent since 1929) the demand schedule has shifted to the left, resulting in a smaller consumption at a given price.

The demand schedule for wheat is practically parallel to the axis of price; it is a nearly vertical line as the charts are usually drawn. The elasticity of demand approaches zero. This means that demand is extremely unresponsive to change in price.

For the past 40 years there has been a steady decline in the use of wheat bread by the American people. In 1909 annual consumption of wheat flour products was 211 pounds per capita. By 1946 it was down to 154 pounds. In 1947 it dropped to 140 pounds—partly, no doubt, as a result of the government campaign to reduce domestic consumption to save wheat for Europe.

The inelasticity of demand of the most important farm crops and the effects of this lack of responsiveness of demand to price has an important bearing on the economics of the farm industry which will be discussed in a later chapter.

The Supply of Agricultural Products. One of the major risks of business and one that is obviously important in farming is that actual demand, supply, and price may change materially during the time required for production. Under normal peacetime conditions, and over a period of a few years, the actual demand for staple farm products is fairly constant. Supply varies from year to year mainly because of favorable or unfavorable growing conditions. In a poor crop year a small crop results in a higher price. The farmer's risk is reduced somewhat because gross revenue from the sale of his crops is more nearly constant than either volume of production or price. When the size of the crop is small, price is high and when volume is high, price is low. Farm income in North America was unusually high during both world wars because both volume of production and price were high. But, ordinarily, low prices are balanced to some extent by high production.

The history of rubber supply and rubber prices illustrates the risk encountered in the production of a natural product that requires a long production period. It also illustrates the additional effects of greatly increased demand and of new methods of production.

Prior to 1890 the chief use of rubber was in the manufacture of waterproof garments and footwear. The chief source of supply was "natural" rubber from the forests of Brazil. The cost of gathering and transport was high, and the supply was limited. First the bicycle and then the automobile greatly increased the demand for rubber. Supply could not be increased fast enough to satisfy the demand. Between 1904 and 1909 there was only a small increase in supply, while the price increased to $1.48 a pound.

The increasing demand for automobile tires required new sources of supply and warranted heavy capital investment. Rubber plantations were started in the Malay States and in the East Indies. In 1909 the plantation rubber constituted only 5 per cent of the total supply, but by 1920 it made up 89 per cent of a total production of nearly 350,000 tons.

Because of the facility with which new plantations could be developed, and because of the reduced cost of producing plantation rubber, supply overtook demand despite its rapid growth, and the price fell from 72.5 cents in 1918 to 16.4 cents in 1921. Obviously, the general price decline of 1920–1921 contributed to this extreme price drop.

This drastic price drop led to an attempt by the British government to restrict output and to hold up the price. The resulting Stevenson Plan was in effect from 1922 to 1928. Prices increased during the first 4 years until the war price of 72.5 cents a pound was regained, but in 1928 prices had again fallen to about the 1921 low. Under the world-wide impact of the 1929–1932 depression, prices dropped to only 3.5 cents a pound. While the plan was in operation, rubber production increased rapidly in the Dutch East Indies where production was not restricted. The Stevenson Plan appears to have worked principally to the advantage of the Dutch producers at the expense of the British plantations.

Rubber is only one of many farm commodities where the attempt has been made to limit supply to match demand and thereby maintain price above the cost of production. Restriction plans have been applied to sugar in Cuba and the United States, to coffee in Brazil, to cotton in Egypt. In the United States the farm policy in effect since the middle 1930's is intended to restrict output and to maintain prices of the principal farm staples.

The control of price usually fails, as did the Stevenson Plan for rubber, because it is seldom possible for the government or other price-supporting agency to control a sufficiently large part of the total output. The control of supply in the case of major farm crops is inherently difficult. It is also difficult to increase demand for staple foods and fibers. It is to the interest of the whole body of producers to limit the size of the crop and so ensure a higher price, but the individual farmer sees his own interest in increasing his own production all the more if aggregate volume will be held down. Where there is a downward shift in the demand curve over the longer term, as we found in a number of farm staples, restricting output offers at best only temporary relief. Demand must be increased or output must be continuously decreased if producers are to improve their position.

An illuminating example of the way the best intentions can go wrong in crop and price control is provided by the experience of the United States government plan for the control of potato prices in 1946. Potatoes were included in the farm parity price program whereby the government guaranteed a minimum price for the crop in return for an agreement with individual farmers covering acres planted. In 1946 there was the greatest yield per acre in the history of Aroostook County, Me.—184 bushels per acre against an average yield of 126 bushels. As a result, the government's Production and Marketing Administration had on its hands a nation-wide surplus of 45 million bushels of potatoes. In 1936 the average yield per acre of the United States corn crop was 16.2 bushels; in the following year the average yield jumped 70 per cent to 28.1 bushels; in 1942 the average yield was 35.2 bushels. Nothing is sure in crop control because supply is so dependent on the weather.

The difficulty of controlling the supply of farm products constitutes a major farm problem because of recurring overproduction and consequent price demoralization. In spite of all the difficulties inherent in the control of supply, it is an objective that is never abandoned. The support of farm prices above some minimum level that will provide a necessary minimum farm income appears to be a policy that is firmly established in the United States.

The Supply of Manufactured Products. The same reasons for restricting output to the actual or estimated demand at a desired price exist with all commodities and products, whether produced by agricultural or manufacturing industries. There is no difference in principle and in the need for and the desire for some measure of control of output in farming and in manufacturing so that supply matches demand at a livable price. The farmer is frequently praised for not restricting his output and producing up to his capacity in good times and in bad times.

But this makes a virtue out of a necessity. The farmer would like to restrict or expand his volume of production (supply) to the market demand at a fair price just as much as the manufacturer. He is not able to do it so easily nor so directly, but fortunately there is a compensating factor in the nature of farming. The financial penalties for excess production in farming are not nearly so severe as they are in manufacturing. (This problem will be dealt with at greater length in a later chapter.)[4]

Supply Schedules. The preceding discussion of demand schedules should be reviewed as an introduction to the subject of supply schedules which will be presented in briefer form.

The way supply varies with price alone and under conditions of perfect competition is the supply function or the supply schedule. The supply schedule for a commodity at a specific time shows the way in which supply increases or decreases as price increases or decreases. Under the stipulated theoretical conditions a decline in price causes a decline in the quantity supplied and an increase in price causes an increase in the quantity supplied.

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[4] Refer to Chap. 9, pp. 185–191.

There are only a few practical applications of this theoretical concept of a supply schedule in which supply changes instantaneously with change in price. The theoretical supply schedule assumes that more or less of available nearby supply will appear on the market with changes in price. One example where supply changes with price without time lag is trading in commodities or in securities on the exchanges. In this situation the offer of a higher price will usually cause an immediate increase in the supply offered for sale at the bid price.

There are many cases in business where current quantity demanded is stimulated by a reduction in price (usually in retail selling), but there are relatively few cases where immediately available quantity supplied can be increased by an increase in price.

A modified application of the supply schedule is found in quotations of farm staples for *future* delivery.

On Thursday, June 26, 1947, the *Wall Street Journal* reported closing futures prices at Chicago as follows:

Month	Wheat	Corn
July	\$2.17½	\$2.02
September	2.13½	1.84
December	2.12¾	1.64
May	2.10¼	1.60½

These declining future prices reflect some combination of an estimated increased supply and an estimated reduced demand at the respective future dates.

Supply in Increasing-cost Industries. Mining industries provide examples of another way in which price is dominant in determining supply. Copper, iron ore, coal, and many other minerals are found under conditions that differ widely in the cost of development and operation of the mines and in the cost of treating the ores; in short, the cost and value of the ore differs widely in different mines. In each industry there are low-cost producers and high-cost producers where the differences are inherent in the natural conditions and where management can do little or nothing about it. Considering each mining industry as a single producer, a material increase in supply—above the capacity of the lowest cost mines — can be obtained only by increasing price accompanied by increasing average cost. Such industries are inherently increasing-cost industries, and increase in supply—at high rates of production, at least—is directly dependent on increase in price.

A distinction should be made between the cost characteristics of an entire industry, such as copper mining and refining, and the corresponding cost characteristics of single mines. Copper mining, as will be shown presently, is an increasing-cost industry, but any one mechanized copper-mining property may be a decreasing-cost operation. Costs per pound of copper produced may increase from one mine to another with increasing total production, but costs per pound of copper produced in a highly mechanized mine may decrease as production is increased up to the limit of physical capacity.

Table 4·3. Copper Produced in the United States in 1918 at Different Costs per Pound*

Cost, cents	Production		Accumulated production	
	Pounds	Per cent	Pounds	Per cent
Below 0.12	122,245,000	5.41	122,245,000	5.41
0.12–0.13	208,571,000	9.24	330,816,000	14.65
0.13–0.14	314,553,000	13.93	645,369,000	28.58
0.14–0.15	359,618,000	15.92	1,004,987,000	44.50
0.15–0.16	98,307,000	4.35	1,103,294,000	48.85
0.16–0.17	460,529,000	20.39	1,563,823,000	69.24
0.17–0.18	255,400,000	11.32	1,819,223,000	80.56
0.18–0.19	72,373,000	3.20	1,891,596,000	83.76
0.19–0.20	28,492,000	1.26	1,920,088,000	85.02
0.20–0.21	36,871,000	1.63	1,956,959,000	86.65
0.21–0.22	135,539,000	6.00	2,092,498,000	92.65
0.22–0.23	60,862,000	2.70	2,153,360,000	95.35
0.23–0.24	44,920,000	1.99	2,198,280,000	97.34
0.24–0.25	6,231,000	0.28	2,204,511,000	97.62
0.25–0.26	7,605,000	0.34	2,212,116,000	97.96
Over 0.26	46,120,000	2.04	2,258,236,000	100.00
Total	2,258,236,000	100.00	2,258,236,000	

* Taken from "Economics for Executives," edited by George E. Roberts, volume XI, p. 22, American Chamber of Economics, New York, 1922.

To a lesser degree than in mining, the average costs of agricultural products are dependent on natural conditions such as the fertility and other qualities of farm lands.

The typical farm unit may be an increasing-cost operation if it contains land of differing fertility or drainage conditions, or if the contours and situation of part of the tillable land require more labor for working than the best land. Good management on the farm requires that poor land and high-labor-cost land be worked only when general business conditions result in a high price level. Good farm managers avoid poor-paying crops at all times, but particularly when demand is weak and prices are low. Even in farming, good management can frequently turn the individual farm into a decreasing-cost unit.

Corn growing as a single industry is obviously an increasing-cost industry. The cost of growing corn varies widely in different states with average yields of 50 bushels per acre in Illinois and Iowa down to 15 bushels per acre in northwestern Texas and Oklahoma. But in farming, high-cost (low-yield) land is not left idle. No one has discovered how the individual farmer can increase his own income by reducing production, no matter how low demand may fall.

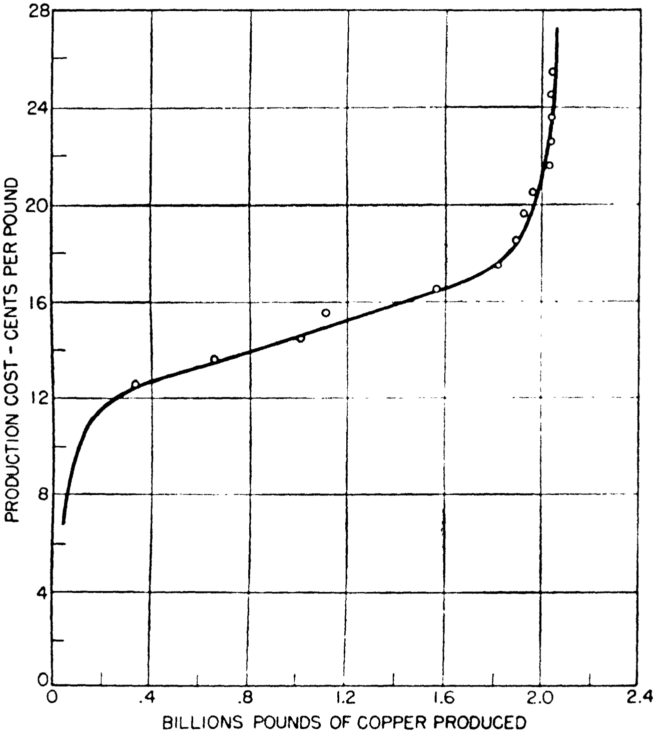

Fig. 4 • 6. Supply Schedule for Copper in 1918

This is an actual supply schedule for copper based on experience during the First World War. The price of copper was deliberately increased up to 26 cents to increase supply. The chart shows that production (supply) was responsive to price up to 17 cents a pound. Above this price a large increase in price was required to bring out only a small increase in supply.

An interesting, practical example of increasing costs and the dependence of supply on price is provided by the experience with copper production during the First World War. A study of copper costs undertaken by the government showed that the costs of major producers in 1918 varied from less than 12 cents a pound to about 24 cents a pound. About half the total available production was produced at 16 cents or less. (The detail figures are shown in Table 4 • 3.)

Inasmuch as over 90 per cent of available copper was required for war production, the government established a price of 23.5 cents a pound which was continued until the middle of 1918. Then, to stimulate still greater output, the government price was raised to 26 cents. It will be obvious from the figures that a progressively higher price would bring out progressively higher production, assuming, of course, that there is sufficient demand as there was during 1918.

The figures in Table 4·3 have been plotted in Fig. 4·6 to show the shape of this actual supply schedule. There was a limited supply below 12 cents and supply increased slowly at production costs above 18 cents. A very large increase in price above 18 cents could increase the supply by only a very small amount.

Summary

This chapter explains the operation of the law of supply and demand and the determination of price under the simplified conditions of the static state and perfect competition.

Demand and supply are functions of price, and, consequently, demand is defined as the way the quantity demanded varies with price; and supply is defined as the way supply varies with price. Supply and demand cannot be stated as definite quantities; the quantity demanded or the quantity that reaches a market must be associated with a price. Supply and demand are equal only when brought into balance by the equilibrium price.

Because demand increases when price is lowered, and because supply decreases under the same price condition, there always will be one price at which demand and supply are equal. This is the equilibrium price; Fig. 4·1 shows this equilibrium condition. If the demand schedule is decreased while the supply schedule is unchanged, the equilibrium price is lowered.

Actual demand in real markets differs from the theoretical demand schedule because many factors other than price affect demand. In fact, price may affect demand very little with some products and in some markets. An example is the incandescent lamp, where the cost of the lamp is only a small part of the cost of the illumination. In any year since 1927, it would have required a reduction of 20 per cent in the cost of the incandescent lamp to cause a 1 per cent reduction in the cost of light.

The demand schedules for different commodities and products vary greatly in the relationship between price and the change in the quantity demanded. The way in which quantity changes with price is called the elasticity of demand. We say a particular demand schedule is highly elastic if a small change in price results in a large change in the quantity demanded. On the other hand, a demand schedule is said to be inelastic if the quantity demanded responds very little to a change in price.

Staple farm commodities that have been studied — such as sugar, cotton, corn, and wheat — are very inelastic; large changes in price have little effect on quantities demanded. This fact has an important bearing on attempts to control the price of farm products.

In actual markets it is difficult to forecast demand, and demand schedules may change, due to changes in the state of business, much more rapidly than total supply can be changed. This is especially true of natural products such as rubber, sugar, coffee, and commodities that grow slowly or have to be transported long distances — rubber, for example. Attempts to control supply of these commodities in order to maintain a more stable price have been signally unsuccessful.

The supply of manufactured products can be controlled more successfully, and, as a result, prices of manufactured goods fluctuate less widely than do the prices of natural commodities and raw materials generally.

Mining is an industry in which the current price can affect production and supply because different mines differ greatly in their costs of production. Therefore, a low price shuts down high-cost producers and a high price increases production by causing high-cost producers to come into the market. For example, during the First World War, the production of copper was stimulated by establishing a high price through government action.

Review Questions

1. *a.* For some specific standardized commodity and under conditions of perfect competition, what major factor or factors determine the quantity demanded and the quantity supplied? What factors determine the equilibrium price?
   b. Under the conditions of actual markets, what additional factors other than price of the commodity influence the quantity demanded of a specific commodity at some specific time? What other factors influence the quantity offered of a specific commodity for sale in a specific market and time?

2. How does elasticity of demand affect change in the quantity demanded with small changes in price? How does this affect the inclination of the demand schedule?

3. Assume the following data concerning the consumption of sugar in the United States:
   a. In 1875 consumption was 40 pounds per person and the average retail price per pound was 10 cents;
   b. By 1925 consumption had increased to 100 pounds per person and the retail price was 5 cents per pound;
   c. By 1948 consumption had decreased to 70 pounds per person and the retail price was 10 cents a pound.

   Which is the more reasonable explanation for the increase in consumption per person from 1875 to 1925 and the decrease in consumption per person from 1925 to

1948: (1) the change in retail price, or (2) the change in eating habits of the American people? Draw approximate demand schedules that illustrate your answer to the above question.

4. Is the demand for sugar highly elastic or inelastic?

5. Does elasticity of demand of such farm commodities as wheat, corn, and cotton facilitate or hinder the control of prices through government price-support programs?

6. Assume a single long-term supply schedule for sugar that is the same from 1875 to 1948. What is the equilibrium price for 1875, 1925, and 1948 demand conditions as you assumed them in drawing your demand schedules in question 3? Do you think it reasonable to assume that the supply schedule has remained the same since 1875? If not, add supply schedules to the chart of demand schedules that you consider more reasonable. Give reasons for your choice of supply schedules.

7. What would have happened to the equilibrium price of sugar in 1948 if you assume the available supply of sugar was limited to 60 pounds per person (consumption was assumed to be 70 pounds per person)? Illustrate this supply-demand condition on your chart of demand and supply schedules. Assume that with the supply limited to 60 pounds per person, the government passed a law holding the retail price of sugar at 10 cents a pound. What would be likely to happen and what further government action might be necessary?

8. During the years following the Second World War there was a limited supply of housing compared with the housing demanded at prewar rents. Draw typical demand schedules and supply schedules that illustrate this condition of a housing shortage. Consider the case of housing that rents for $50 to $75 a month. Congress passed a rent control law that held the rents of small homes and apartments considerably lower than the equilibrium price (rent). In your opinion did rent control help or hinder the correction of the postwar housing shortage? Give reasons for your opinion.

9. Some economists maintain that any restriction of supply (*i.e.*, production) in order to establish a price desired by the producer is socially indefensible because such restriction leads to employment of resources (land, factories, or labor) below the optimum level. The supply of manufactured products can be easily controlled to hold supply in line with demand at an equilibrium price set by the producer. The supply of agricultural products, on the contrary, is very difficult to control to balance demand at some desired price. Give reasons for this difference. Is this difficulty in controlling the supply of farm products an advantage or disadvantage to the over-all economy?

   If the supply of agricultural products could be controlled as successfully as the supply of manufactured products, should the supply of agricultural products be restricted in order to maintain some minimum level of prices? How does your answer agree or disagree with current government policy regarding farm prices?

10. In the First World War the supply of copper was increased by establishing a relatively high price of 23.5 cents a pound which later in the war was increased to 26

cents. In the Second World War copper production was increased by a government subsidy to high-cost producers. Both of these methods were effective to some extent in increasing supply. What general condition that affects most mining operations made these methods effective? Would the same methods of stimulating production be effective with farm products? With the general run of manufactured products?

5. THE OPERATIONS OF THE BUSINESS FIRM

We have just considered the mechanism of exchanging goods under the simple conditions of perfect competition. We will now consider the mechanism of production under the same simple conditions. Production is more complex than the exchange of goods already produced, and it will be advisable to look into some preliminary matters before we tackle the main problem.

The course of production depends largely on the decisions of management. It is management that brings the factors of production together in effective proportions; it is management that decides to start a new business or to go out of business; to increase output or to reduce output. Under the conditions of perfect competition, with which we shall begin, the management of a single firm has no control over market price and the demand and supply schedules of the specific product, as explained in the preceding chapter. The market price will change as over-all conditions of supply and demand change for the entire industry, but, by assumption, no single firm is large enough to affect the market price by changing its output.

The Profit or Loss Incentive. What general principle, then, is behind the decisions of management that determines the state of production? What governs the decision to increase production or to decrease production? In the system of individual capitalism, these decisions are made by millions of independent manufacturers, farmers, and other businessmen. There must be some universal controlling or regulating force; otherwise a system which permits such independence of decision could lead only to chaos; it would have no chance of successful achievement nor could it reach a common objective. There would be no coherent, balanced production program to match the needs and desires of consumers. The universal controlling force that governs the decisions of businessmen and that makes private capitalism a successful system is the expectation of profit and the opposite fear of loss. This profit or loss incentive is merely one form of the universal desire that people have to live and to get ahead in the world. The desire to earn profits or avoid loss is one form of the general desire of people to work for their own best interests. Under the conditions of the static state and perfect competition, there is no conflict between individual interests and the general interest.

Common experience teaches that businessmen act in a way that will increase profit to the possible maximum extent. They will start new factories, farms, or stores in the expectation that a profit can be earned; they will shut down a business enterprise when hope of profit is no longer tenable or more frequently when losses can no longer be borne. They will increase production and employment when it is profitable; they will reduce production and employment to avoid loss. Profit or the avoidance of loss is the primary controlling factor in the operations connected with production in private business under individual capitalism.

It is evident from the preceding that the expectation of profit and the complementary fear of loss are fundamental factors in determining the behavior of businessmen and in explaining the operations of the business firm. But there is real difficulty in fitting this necessary factor into the discussion of the operations of the business firm under conditions of the static state and perfect competition. Profit, as we ordinarily think of it, cannot exist under the conditions of complete knowledge, absence of uncertainty, equality of opportunity, and fluidity of resources that are assumed to exist in the static state.

Business profits in the usual accounting sense are the result, principally, of such conditions as the uncertainties of business, differences in judgment, differences in financial, managerial, and technical skills, and unequal opportunities and advantages of one business firm over others. None of these conditions necessary for profits exists under the assumptions of the static state and perfect competition. There is, in fact, in the static state little opportunity for the exercise of managerial judgment or skill beyond the most routine form of supervision.

The theorist, attempting to explain the operations of the business firm under conditions of the static state and perfect competition, faces a real dilemma. True profit cannot exist, but the concept of profit is necessary to account for the behavior of businessmen and for the regulation of a system of private capitalism and individual initiative.

The Concept of Profit under Perfect Competition. It was pointed out in Chap. 3 that in the imaginary static society and under the conditions of perfect competition every worker is able to achieve a position which is to his own greatest advantage. But every other worker can do the same. Consequently, no worker can gain more than the common exchange value of his own labor. And when every worker receives the full market value of his own labor, there is no residual value—there is no profit. Under the simple structure and organization of the static state, with every worker an individual unit and with all information common knowledge, there is no possibility of gain other than the compensation or exchange value of routine labor.

Obviously this absence of profit in the static society is quite different from the important role of profit in actual industry. The difference, of course, arises from the major differences in the structure and organization of actual industry and the conduct of real people as compared with the assumptions that define the static state.

In order to explain the existence of profit in the real world, the economist is forced to connect profit with the major differences between the static state and the world we live in. There is no uncertainty in the static state, but the actual businessman is faced by uncertainty wherever he turns. Uncertainty and the assumption of risk are the principal explanations of profit. Uncertainty in real industry provides the opportunity for profit but only for managements of more than average ability and business judgment. Quality of management—for which there is no place in the static state—is one of the major reasons for the wide variations in the profits actually earned by different firms.

Economic theory of the static state and perfect competition provides compensation for owners instead of profit. Owners receive as their share of the product interest on capital owned and used in the business, the equivalent rent of land and of other natural resources owned and used, and compensation—at the market rate—for the services of owners who also act as managers. Under other conditions as in a dynamic, changing society, or where monopoly or imperfect competition exists, true profit, in addition to the compensation just described, can be taken out of the market value of the product. Such true profit is sometimes called *pure profit.*[1]

In actual business compensation for owners and for owner managers cannot be separated so neatly from the economists' true profit. Profit, as understood by businessmen and as it is defined in usual accounting practice, is the total residual after all current payments and charges, representing the cost of the product, are subtracted from total income arising from current operations. Nor are the different sources of accounting profit entirely independent even in theory. The "market rate" for the services of management—what owners are willing to pay for management—depends greatly on a manager's ability to produce pure profit and cannot be separated from pure profit. Neither can the owners' return on invested capital be entirely separated from pure profit. The assumption of risk by owners is sometimes given as justification for pure profit, but payment for risk is never guaranteed. Business risks are not insurable.

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[1] Incidentally, this theoretical distinction between "compensation" and "profit" may possibly be responsible for the reproach and opprobrium which are sometimes evident in discussions of profits of actual business. Pure profit is sometimes called "monopoly profit" in a derogatory sense.

The dilemma may be resolved—not very logically or satisfactorily—by assuming that equilibrium in the operations of business firms is reached before pure profit is eliminated completely, and that sufficient profit is earned in the industry at equilibrium to keep existing firms in business but not to attract new firms into the industry. This minimum profit is sometimes called *normal profit.* (The very important role of accounting profit and loss is discussed more satisfactorily and at some length in Chap. 10.)

Conditions of Equilibrium. When considering the operation of business firms, it is necessary to make a distinction between equilibrium of an industry and equilibrium of a single firm; and between short-term equilibrium and long-term equilibrium.

Equilibrium of an industry—like that of an entire market—depends on the over-all demand and supply schedules which were discussed in the preceding chapter. Market price at equilibrium for the commodity or for an industry is the price and output at which the over-all demand for the products of the industry balances the over-all supply.

When an industry is in equilibrium, there is no tendency for prices and outputs to increase or decrease; there is no tendency for firms either to leave the industry or to enter the industry. Because profit or loss is the main incentive behind these decisions, when the industry is in equilibrium, there is no profit (above normal profit) to encourage additional output or to attract new firms; likewise there is no loss to force contraction of output or to repel new firms.

For the single firm under perfect competition the equilibrium price is the market or industry price. The individual firm is assumed to be too small to influence market price by any change in its own output. Equilibrium output of the single firm, as will be explained, depends on the relationship of its costs to market price. With the assumption or convention that normal profit is treated as one of the costs of operation, total costs equal total revenue at equilibrium.

This discussion will be confined to conditions of short-term equilibrium. Under short-term equilibrium, transition from one condition of equilibrium to another is assumed to take place instantaneously. Long-term equilibrium makes the more realistic assumption that changes take considerable time to develop and may never be completed before "other conditions" change again. Long-term equilibrium analysis is an attempt to approach the conditions of the dynamic state in which change is the normal condition. In later chapters of this volume which treat the behavior of the aggregate economy, the long-term equilibrium conditions of aggregate income, for example, are considered at some length. Here it will be sufficient to confine our attention to short-term equilibrium.

Cost Relationships. A very important factor in the practical affairs of manufacturing firms and in the determination of output policy is the existence of overhead costs or *fixed costs.* These are costs that are fixed in amount and are incurred whether the output is small or large—as distinguished from direct costs, or *variable costs,* that change with output.

Industries that use little machinery and much hand labor have relatively low fixed costs and high variable costs. On the other hand, highly mechanized production of engineered products, more typical of modern manufacturing, is accompanied by relatively high fixed costs and relatively low variable costs.

In actual industry no sharp line can be drawn between purely fixed costs and purely variable costs. Many kinds of cost vary with output, but at a considerably lower rate than output. It is useful, nonetheless, to treat total cost as divided into fixed elements and variable elements. Some kinds of cost then will be a combination of a fixed element and a variable element.

The cost of raw materials and parts that go into the product and the cost of labor that goes into the product directly are obvious examples of variable costs that change in approximate proportion to output. The salaries of officers and major managers, on the other hand, are primarily *fixed costs* because their salaries are a charge against operations without regard to the volume of the output. Another example of fixed costs is the depreciation allowances based on the first cost and expected life of buildings and equipment.

Variable costs (and expenses) are usually authorized by production orders or schedules; fixed costs (and expenses) are usually authorized for a specified budget period by management approval of operating budgets. Thus, fixed costs may be "fixed" only for a single budget period which is usually 1 year.

It should be noted that fixed and variable costs are fixed or variable only with respect to total costs. These characteristics are reversed with respect to unit costs (total costs divided by the number of units of output).

Figure 5 · 1 illustrates the fixed and variable elements of total cost for an actual incandescent lamp factory.

Fixed costs in this example amount to $300,000 a month, and variable costs amount to 4 cents for the average-size lamp produced. At two-shift capacity of 18.2 million lamps per month, total variable costs are, therefore, $728,000. Thus, fixed costs amount to roughly 40 per cent of variable costs at capacity output. This is a significant ratio which varies widely in different types of manufacturing industry.

This lamp factory is in reality an assembly plant in which the parts of the lamp—filament, base, and glass bulb—are assembled together; the air is exhausted from the bulb and the bulb is filled with a chemically inert gas to improve the efficiency and life of the lamp. These operations are highly mechanized. Specially designed lamp-assembly machines carry out the operations automatically in proper sequence and the greater part of the manual labor is the loading and unloading of the machines. Normal output capacity of the plant is determined by the number, size, and speed of the machines and the number of hours per month the plant is operated. The proportion of labor to capital is fixed by the design of the lamp machines. Without changing or increasing equipment, output can be increased in a major way only by working more hours per month.

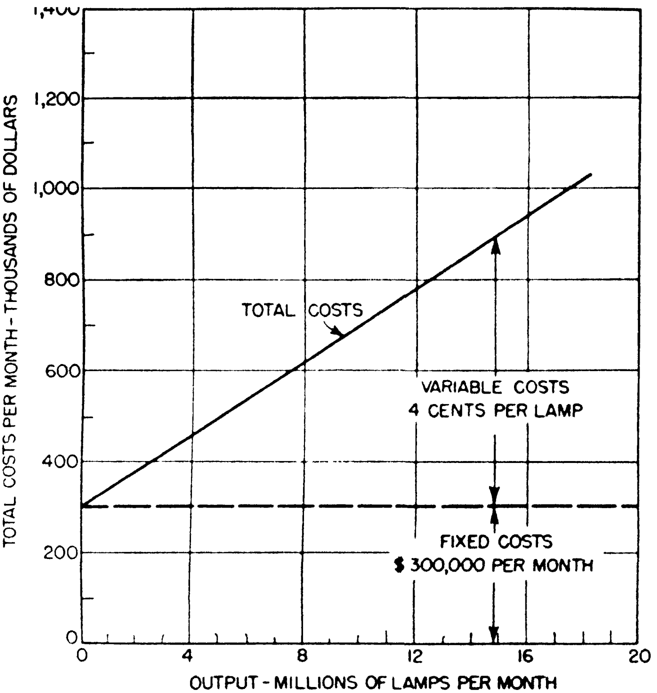

Fig. 5 · 1. Fixed and Variable Costs of a Lamp Factory—Total Cost Basis

Total costs in a mechanized factory are made up of a fixed-cost element (that does not change as output is increased) and a variable-cost element that changes in some way with output. Variable cost is usually treated as if it increased directly with output, as shown in this chart.

Figure 5 · 2 illustrates the same lamp-factory costs on a unit basis. The composition of the unit costs can be seen from the fixed and variable costs per lamp tabulated in Table 5 · 1.

It is apparent from Fig. 5 · 2 that unit costs decreases rapidly as output is increased from low volume and approaches the variable unit cost of 4 cents at capacity output. The effect of reducing fixed cost is to reduce unit cost very greatly at low output volumes.

This effect of fixed costs is to make it impossible for a factory with relatively large fixed costs to earn a profit at low and moderate outputs. Fixed costs, consequently, are an important factor in leading manufacturers to strive for maximum possible plant output.[2]

The analysis of equilibrium output based on marginal cost, which will be shown presently, is usually carried out on a unit-cost basis. Business managements, however, in reaching decisions concerning increased or decreased output, prefer to deal with total costs as shown by Fig. 5 • 1.

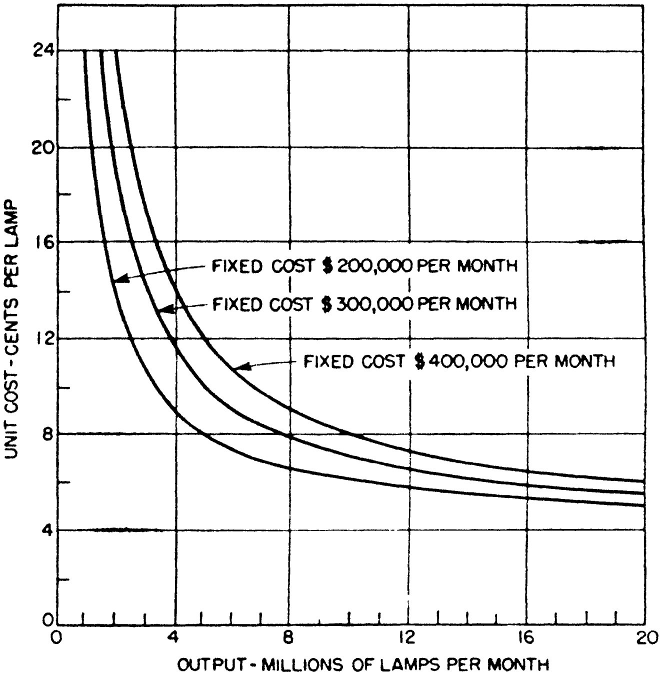

Fig. 5 • 2. Unit Costs at Different Fixed Costs

When costs are shown on a unit basis, total fixed costs become variable per unit and total variable costs become fixed per unit. The effect of total fixed costs is to make unit cost very large at low outputs and to cause unit cost to decline as output increases. In the typical case where fixed costs are appreciable, total unit cost declines throughout the whole range of practicable output.

It is only in a highly specialized factory that produces a single product that output can be measured in terms of physical units. Where a number of different products are made in the same factory or mill, the only practicable unit of output is the dollar, and management necessarily deals with total costs and total revenue.

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[2] The practical importance of fixed costs is discussed at length in Chap. 9.

Market Price and Revenue. There is one more point to consider before we are ready to investigate the factors that determine the equilibrium output of a factory, the product of which is sold under conditions of perfect competition. The pertinent conditions that the assumption of perfect competition leads to are (1) that no profit other than normal profit will be earned and no loss will be incurred (but with all costs, including owner-management compensation, provided for); (2) that the unit market price is established by market conditions beyond the control of the factory management; and (3) that the market price is not affected by any change in output of the single factory. Market price may change because of over-all demand and supply conditions, but for the purposes of this study a single constant market price will be assumed. The market price or *unit price* is also *unit revenue.*

Table 5·1. Unit Costs at Different Fixed Costs

Output, million lamps	Total fixed costs $200,000			Total fixed costs $300,000			Total fixed costs $400,000		
	Unit fixed cost	Unit variable cost	Unit total cost	Unit fixed cost	Unit variable cost	Unit total cost	Unit fixed cost	Unit variable cost	Unit total cost
2	$0.1000	$0.04	$0.1400	$0.1500	$0.04	$0.1900	$0.2000	$0.04	$0.2400
4	0.0500	0.04	0.0900	0.0750	0.04	0.1150	0.1000	0.04	0.1400
6	0.0330	0.04	0.0730	0.0500	0.04	0.0900	0.0670	0.04	0.1070
8	0.0250	0.04	0.0650	0.0375	0.04	0.0775	0.0500	0.04	0.0900
10	0.0200	0.04	0.0600	0.0300	0.04	0.0700	0.0400	0.04	0.0800
12	0.0167	0.04	0.0567	0.0250	0.04	0.0650	0.0330	0.04	0.0730
14	0.0143	0.04	0.0543	0.0214	0.04	0.0614	0.0286	0.04	0.0686
16	0.0125	0.04	0.0525	0.0187	0.04	0.0587	0.0250	0.04	0.0650
18	0.0111	0.04	0.0511	0.0167	0.04	0.0567	0.0222	0.04	0.0622
20	0.0100	0.04	0.0500	0.0150	0.04	0.0540	0.0200	0.04	0.0600

Equilibrium Output—Perfect Competition. We have now defined unit cost and unit revenue. Equilibrium without profit or loss will be reached at the output where unit cost equals unit revenue. For reasons that will be developed as we proceed, marginal cost must also be equal to unit cost and unit revenue. The behavior of these three factors—unit revenue (market price), unit cost, and marginal cost—with the full range of output up to about 120 per cent of capacity—is shown graphically in Fig. 5·3. The same lamp-factory costs of Figs. 5·1 and 5·2 are used in Fig. 5·3.[3]

Unit revenue (market price) is shown by the horizontal line *hd* at 7 cents per lamp.

Unit costs of Fig. 5·3 are those corresponding to fixed costs of $400,000 per month of Fig. 5·2. There is one important difference. The unit cost shown in Fig. 5·2 is the curved line *CPB* of Fig. 5·3. The unit cost that will be used in this analysis is the U-shaped curve *CPC*^{1}.

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[3] Refer to pp. 102-103 of this chapter for discussion of plant capacity.

What has been done is to exaggerate the effects of the principle of diminishing returns—of increasing unit cost—at large output because unless the effects of diminishing returns are appreciable, there is no output at which equilibrium will be reached. (This limitation was referred to in the description of the principle of diminishing returns in Chap. 3.)[4]

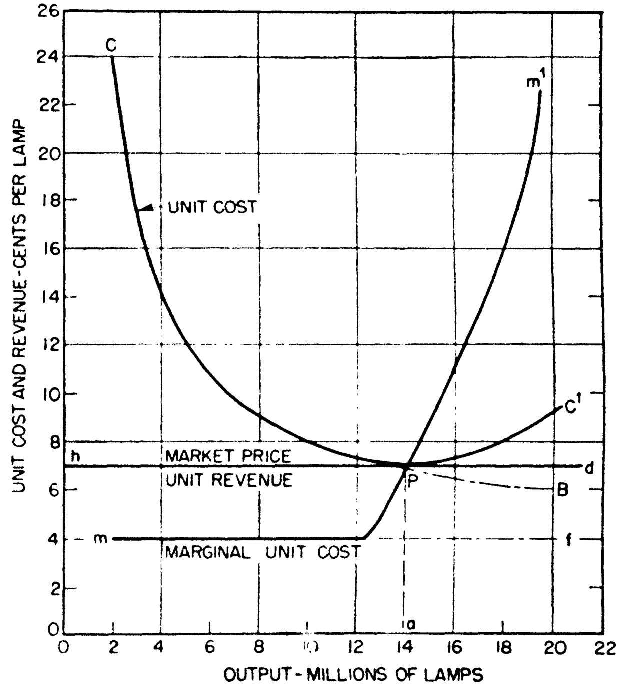

Fig. 5·3. Total Cost and Revenue of a Lamp Factory—Perfect Competition, Zero Profit and Loss

Under conditions of perfect competition, the equilibrium output is reached when marginal unit cost is equal to marginal unit revenue, which is also average unit revenue and market price. Equilibrium is attained when there is no profit or loss advantage in producing another unit of output. In this chart, under the assumption of no profit and no loss, the lines of marginal unit cost, unit cost, and unit revenue intersect at the equilibrium output.

The curve *CPC*^{1} is the curve of unit cost. It is the *average* unit cost averaged over total output up to each point of the unit-cost curve. Under the combined influence of fixed costs and increasing returns, unit cost decreases rapidly at low outputs—up to about 10 million lamps per month—then decreases less rapidly and at between 12 and 13 million lamps per month under the influence of diminishing returns begins to increase slowly at first and then more rapidly. This increase in unit cost—beyond the output of 14 million lamps per month—is intended to show the effects of diminishing returns from the use of more and more labor in combination with a fixed amount of capital facilities. These exaggerated effects of diminishing returns are not found in the typical or representative firm in modern mechanized industry, as will be explained presently, but we will proceed with the analysis on the assumption that the principle of diminishing returns is effective in increasing unit cost within the range of output shown.[5]

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[4] See pp. 56-58.

Marginal Unit Cost. In Chap. 3 marginal unit cost was defined as the additional cost required to produce the marginal product. In this case the additional cost for each lamp (or unit of 1 million lamps) is the variable cost. Up to an output of between 12 and 13 million lamps, the variable cost is constant at 4 cents per lamp. Marginal unit cost, therefore, up to 13 million lamps, is shown by the horizontal line at 4 cents. At larger outputs marginal unit cost increases very rapidly because of the assumed increase in unit cost. Unit cost, it should be remembered, is an average cost, and a small increase in average cost requires a much larger increase in the cost of the last units added. The chart shows unit revenue, unit cost, and marginal unit cost all intersecting at an output of 14 million lamps. This is the equilibrium output at which there is no profit and no loss. At both smaller outputs and larger outputs the unit-cost line lies above the horizontal unit-revenue line, which, of course, indicates a loss incurred on each lamp sold. It may also be noted in passing that with the unit-cost line *CPB* a profit is indicated where the cost line is below the revenue line. For this cost line, the corresponding marginal unit-cost line is the longer horizontal line *mf* at 4 cents. As long as the three lines (revenue, average unit-cost, and marginal unit-cost) do not intersect, a condition of equilibrium is not reached.

It is easy to see why average unit cost and unit revenue must be tangent at the equilibrium output, inasmuch as there is no profit and no loss. But the reason why the marginal unit cost should also equal average unit cost and unit revenue at equilibrium output is not so obvious.

It can, however, be explained in a number of ways. As long as marginal unit cost is less than average unit cost, the average unit-cost curve declines; when marginal unit cost is equal to average unit cost, the average unit-cost curve is at its minimum value; when marginal unit cost exceeds average unit cost, the average unit-cost curve rises. A ball player must be hitting currently above his average percentage if his percentage is rising. If the cost of an additional unit is equal to the average cost of all previously manufactured units (n units), the new average cost of ($n + 1$) units will be the same as of (n) units; if the marginal unit cost of the second additional unit is *greater* than the average unit cost for ($n + 1$) units, the average unit cost of ($n + 2$) units will be increased by the addition of the higher cost unit to the total.

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[5] The downward sloping shape of the unit-cost curve is caused almost entirely by the influence of fixed costs on unit cost and only to a minor degree by the effects of increasing or diminishing returns. This factor of fixed costs greatly complicates the application of marginal analysis. The concept of marginal cost assumes that each additional unit of labor or capital produces additional output (marginal product) that can be identified physically with the additional unit of labor or capital. In modern mechanized industry, however, the additional unit of labor represents variable cost only, but the existing fixed-cost elements contribute importantly to the additional output. Actually there is no way by which one more unit of labor or one more unit of capital can be identified with the additional output that may result.

The intersection of the marginal unit-cost curve and the average unit-cost curve at the minimum point of the latter can be explained in still another way:

1. Whenever marginal unit cost is greater than average unit cost, the latter must rise with additional output.
2. Whenever marginal unit cost is less than average unit cost, the latter must fall with any additional output.
3. It follows from (1) and (2) that where the rising marginal unit-cost curve intersects the falling average unit-cost curve is the minimum value of average unit cost.

Calculation of Marginal Cost. The surest way to understand the somewhat complicated relationships of unit costs and revenue that have just been explained is to go through the detailed calculations, step by step. The calculation of the values shown graphically in Fig. 5·3 is given in Table 5·2. Total Cost, column (2), for each value of output is calculated by adding the constant cost of $400,000 to the total variable cost (number of lamps multiplied by 4 cents per lamp up to and including 13 million lamps). For outputs in excess of 13 million lamps, total cost is calculated from the unit-cost curve of Fig. 5·3 and the total number of lamps.

Column (3), Unit Cost, is calculated directly from columns (1) and (2) or taken directly from the unit-cost curve.

Column (4), Marginal Product, is the increment of output. In this case the increment is 1 million lamps in every instance.

Column (5), Marginal Cost, is the cost of the marginal product. In this example it is the additional total cost, column (2), for each increment of output over the previous total cost. Column (6), Marginal Unit Cost, is calculated by dividing marginal cost, column (5), by marginal product, column (4).

This arithmetical method of calculating marginal product, marginal cost, and marginal unit-cost is only approximate for the outputs above 13 million where variable cost and marginal cost are increasing. Accurate values for increasing marginal costs require the use of calculus because the concept of marginal cost involved the concept of infinitely small increments of output. The values shown are approximate *average* values for the increment of

1 million lamps. Also, for this same reason these average values of marginal unit cost are plotted in Fig. 5·3 midway between the output corresponding to the value of marginal unit cost in Table 5·2 and the next lower value of output. Thus, marginal unit cost of 6 cents per lamp, shown in Table 5·2 at 14 million lamp output, is plotted at an output of 13.5 million lamps in Fig. 5·3.

Table 5·2. Cost and Revenue of a Lamp Factory
Perfect Competition—No Profit–No Loss

(1) Monthly output, million lamps	(2) Total cost, thousand dollars	(3) Unit cost, cents per lamp	(4) Marginal product, million lamps	(5) Marginal cost, thousand dollars	(6) Marginal unit cost, cents per lamp	(7) Market price, cents per lamp	(8) Total revenue, thousand dollars
1	$ 440	44.00	1	$ 40	4.0	7	$ 70
2	480	24.00	1	40	4.0	7	140
3	520	17.33	1	40	4.0	7	210
4	560	14.00	1	40	4.0	7	280
5	600	12.00	1	40	4.0	7	350
6	640	10.67	1	40	4.0	7	420
7	680	9.71	1	40	4.0	7	490
8	720	9.00	1	40	4.0	7	560
9	760	8.44	1	40	4.0	7	630
10	800	8.00	1	40	4.0	7	700
11	840	7.64	1	40	4.0	7	770
12	880	7.33	1	40	4.0	7	840
13	920	7.08	1	40	4.0	7	910
14	980	7.00	1	60	6.0*	7	980
15	1,065	7.10	1	85	8.5	7	1,050
16	1,168	7.30	1	103	10.3	7	1,120
17	1,292	7.60	1	124	12.4	7	1,190
18	1,440	8.00	1	148	14.8	7	1,260
19	1,615	8.50	1	175	17.5	7	1,330
20	1,840	9.20	1	225	22.5	7	1,400

* Theoretically, marginal unit cost also should be equal to 7 cents at the equilibrium output. A more accurate calculation would show equilibrium output to be slightly greater than 14 million lamps

It will be observed that up to an output of 13 million lamps marginal unit cost is the same as unit variable cost. It is only when unit variable cost begins to increase that marginal unit cost begins to increase. A correlated fact of major practical importance is that marginal cost is not affected by the size of fixed costs, no matter how large fixed costs may be. This can be seen by referring to Fig. 5·5. Marginal cost is affected only by additional cost for the small additional output.

Column (7), Market Price, is assumed to be 7 cents per lamp, equal to minimum value of unit cost. This market price is the price to wholesale distributors. In actual markets the retail price is higher and includes the costs of retail distribution.

Total Cost and Revenue Chart. Figure 5 • 4 illustrates the same cost and revenue relationships as Fig. 5 • 3 except that total values are shown instead of unit values.

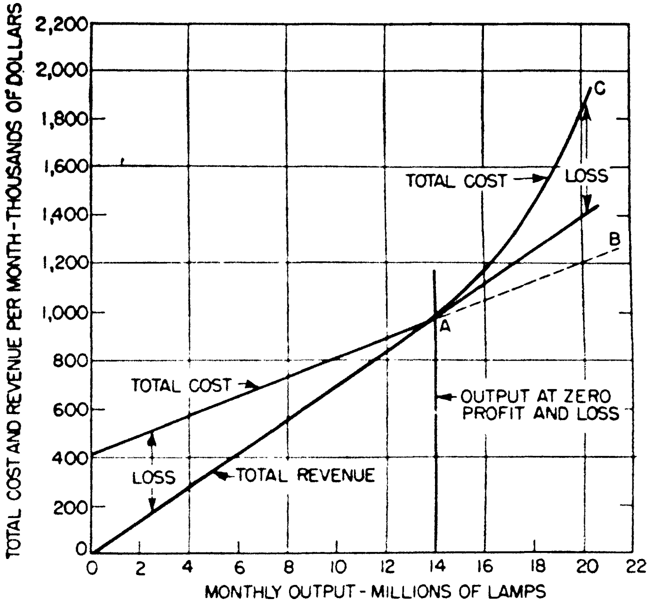

Fig. 5 • 4. Total Cost and Revenue of a Lamp Factory—Perfect Competition, Zero Profit and Loss

This chart shows the same results under the same conditions as Fig. 5 • 3, when total costs are used instead of unit costs.

Equilibrium output is reached when the cost of an additional unit of output is equal to the added revenue obtained. This condition exists when the total-cost line has the same slope (inclination) as the total-revenue line. When there is no profit and no loss, the cost and revenue lines are tangent at the equilibrium output.

Total revenue and total costs are taken from columns (2) and (8) of Table 5 • 2 and require no further explanation.

It will be seen that the total-cost line lies above the total-revenue line at all outputs except 14 million lamps where the two lines are tangent, indicating no loss and no profit.

The dotted portion of the total-cost line, AB, corresponds with the dot-and-dash extension of the unit cost line, *PB*, of Fig. 5 • 3.

It is possible to explain marginal cost and marginal revenue relationships by using total figures instead of unit figures, and this treatment may be more readily understood by those who are familiar with total-cost and revenue charts such as Fig. 5 • 1 and Fig. 5 • 4.

Figure 5 • 5 has been prepared to illustrate this alternate explanation. Marginal revenue is, by definition, the increment of revenue resulting from a small increment of output. The increment of output shown is an increase of 1 million lamps—from 12 to 13 on the horizontal scale. The corresponding marginal revenue is represented by the vertical line, r_1r_2. Similarly, the marginal cost for the same increment of output is represented by the vertical line, c_1c_2. It is clear at this output and with the assumed total-cost and revenue lines, marginal revenue exceeds marginal cost. Profits, therefore, are still increasing with increasing output. Total profit or loss is shown directly by the vertical distance between the total-cost and total-revenue lines.

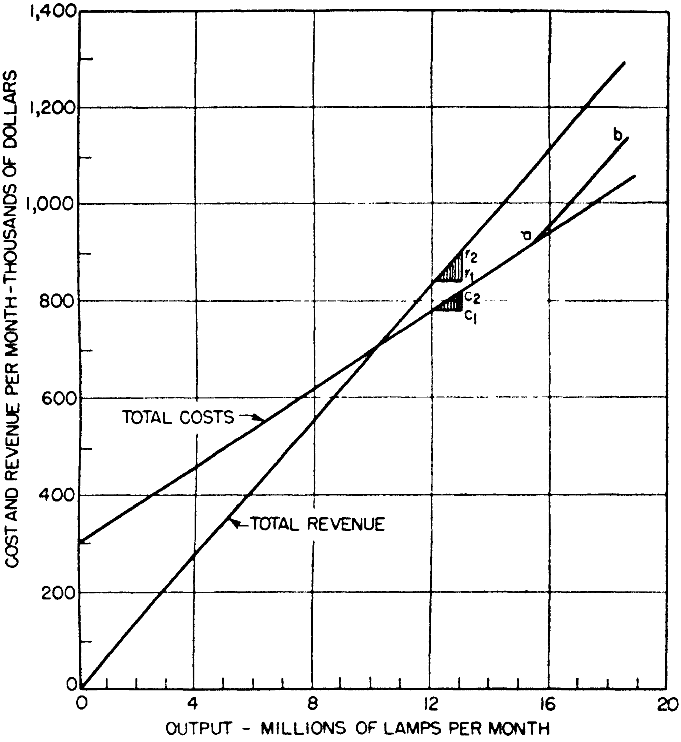

Fig. 5 • 5. Total-cost and Revenue Chart of a Lamp Factory

The condition of equilibrium, equal marginal cost and marginal revenue, is illustrated by the two shaded triangles. Marginal cost (c_1c_2) is equal to marginal revenue (r_1r_2) when the total-cost line and the total-revenue line have the same slope—as at *ab*.

It is also clear that total profit will continue to increase as output is increased, as long as the total-revenue and total-cost lines diverge.

Profits will reach a maximum when these two lines become parallel either by the cost line bending up or the revenue line bending down. This condition of maximum profit is shown diagrammatically in Fig. 5·5 by the cost line bending up in the position *ab*.

In Fig. 5·4 the necessary parallelism is gained by the total-cost line bending upward when it would otherwise have intersected the total-revenue line. It is evident from Fig. 5·5 that there is no output at which profit reaches a maximum and starts to decrease until marginal cost increases so much (or marginal revenue decreases so much) that marginal cost and marginal revenue become equal. At equilibrium the final unit of output adds as much to cost as it does to revenue.

The Practical Importance of the Shape of the Unit-cost Curve. The assumption of a unit-cost curve of the single firm showing minimum cost at some output less than capacity output is a necessary condition for the conclusions reached in this short-term analysis. If the cost curve continued to decline for outputs up to and in excess of capacity, there would be no output at which equilibrium would exist for the single firm. It is an interesting characteristic of the state of perfect competition that it can exist only among groups of increasing-cost producers where the effects of diminishing returns are considerable. Unless the average unit-cost curve of the single firm turns upward (and turns up within the limits of physical capacity of the factory, as shown in Fig. 5·3), there can be no point of equilibrium output. If a state of unlimited and ruthless competition is assumed, and one producer tries to increase output to maximize his profit (or reduce his loss) by reducing his price below the market price and all other producers meet the new price, the "war" would go on to its logical conclusion when only one producer survived. Thus, perfect competition would change finally into pure monopoly.

The French economist Cournot pointed out more than a century ago that competition could not survive among firms with short-term *decreasing*-cost curves, granting that managements of competing firms would engage in commercial warfare to the death. There would be no equilibrium output and no stopping point; ruthless competition would continue until only one firm survived the war. Monopoly would become the general rule.[6]

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[6] Douglas, Paul H., "Theory of Wages," p. 24, The Macmillan Company, New York, 1934. Note also the following paragraph from an article on "What Is Perfect Competition," by Joan Robinson, in the *Quarterly Journal of Economics*, vol. 49, p. 118, Harvard University Press, Cambridge, Mass., 1934–1935.

"First, consider the case in which the firms have falling marginal costs for all outputs . . . Then, so long as the market is perfect, it is impossible for two firms to survive in the industry. If there are two firms, each will be anxious to increase its output at the expense of the other, and any cut in price made by one of them will be answered by an equal cut by the other. Price will be driven down to the point at which one or the other of the firms is forced out of the industry . . . Of course, both firms may survive if each is afraid to begin the war."

Because this warfare of the jungle has not actually happened in industry, it is assumed by some economists that short-term increasing costs are typical of modern manufacturing industry and that ruthless competition is stopped by increasing costs and a lowering of profit or the emergence of loss. Another and more reasonable explanation is that the great majority of managements has learned the hard way and after many trials that price wars benefit no one—not even the consumer—in the end. Stability is reached and maintained in actual industry by deliberate policy.[7]

The upturn of the average unit-cost curve of the single firm—that is used traditionally in short-term marginal analysis—is accounted for in various ways: by the overcrowding of labor in existing facilities; by the greater complexity of the large-size plant; by the spreading of management and supervision too thinly over too large an operation. In practical industry, however, the amount of direct labor employed is governed by the equipment and other work stations that are available. Management can easily control the amount of direct labor employed. Overhead or fixed-cost labor does not affect marginal costs in the short run, as has been explained.

The shape of the unit-cost curve and its implications for short-term marginal analysis is a subject for heated discussion and argument among the specialists in this field. Some economists are beginning to question the validity of the U-shaped cost curve which is a necessary assumption for equilibrium. Those who argue for the traditional U-shaped cost curve usually deny the validity of empirical cost data from single cases that show declining unit cost up to capacity output such as that shown by Table 5 · 3 (page 101). Whether or not the flat or declining average unit-cost curve is capable of proof by actual cost data, it is a fact that managements think in terms of linear cost functions in making price and output decisions. The technical literature of factory administration and cost accounting invariably deals with linear total costs, as illustrated in Fig. 5 · 1. Management does not base its decisions on rising unit costs at or near capacity output. Operating managements rarely, if ever, base their decisions on marginal analysis and ouputs of least cost. Usually managements deal with total costs instead of unit costs. In the typical manufacturing plant costs are determined on the assumptions that total fixed costs are constant over the short term (such as a budget period) and that variable costs increase strictly in proportion to output up to maximum output, as shown by Fig. 5 · 1 in this chapter. Under these conditions there is no increase in average unit costs within the limits of practical capacity. Marginal costs are not affected by fixed costs. Marginal costs increase only when unit variable costs increase.

The characteristic decreasing cost of the single firm in modern manufacturing is strengthened by the trend toward unit factory design to provide for efficient low-cost operation over a wide range of output. Factories are

[7] Stability in actual markets is discussed in Chap. 8, pp. 153–158. Note especially p. 156.

designed with a number of more or less duplicate production and assembly lines within a single factory or as a number of separate similar factories in different market areas. Output is varied by shutting down or starting up self-contained production units. In this unit-type factory the unit-cost curve is a series of short discontinuous cost curves that have a downward trend caused by the spreading of fixed costs over more units of output.

The average unit costs shown for the lamp factory in Fig. 5·2 are calculated from mathematically constant fixed total costs and variable unit costs, as shown by Table 5·1 in line with usual management practice. It may be objected that decreasing unit costs follow inevitably from these cost assumptions. Actually there is some small increase in the variable unit cost as output approaches physical capacity because of less efficient operating conditions, but the increase is too small in the typical case to bring marginal unit costs anywhere near average unit costs which is one of the measures of the most profitable output or to overcome the reduction in unit cost when fixed costs are taken into account.

Table 5·3. Unit Costs at Different Capacity Outputs

Operating conditions	Lamps, capacity per week	Unit fixed cost	Unit variable cost	Average unit cost
5-day week—one shift	1,650,000	$0.0372	$0.0388	$0.0760
5-day week—two shifts	3,000,000	0.0221	0.0393	0.0614
6-day week—two shifts	3,420,000	0.0203	0.0399	0.0602

As described previously, the physical capacity of a lamp factory is pretty well established by the number, type, and maximum speed of its lamp-assembly machines. Each assembly machine with its fixed complement of workers is a production unit. Large storage space is required for inventory stocks of glass bulbs, of shipping cartons, and of finished lamps. Thus, the capacity of an existing lamp factory can be increased by installing improved, higher speed machines, by crowding in more machines in the existing production floor space, or by reducing storage space relatively to production space. Capacity can be increased without making physical changes by operating 6 days instead of 5 days and by using two shifts of 8 hours each instead of one.

Variable unit costs would not be increased by any of these methods of increasing output except that variable and fixed costs will be increased somewhat by increasing the working hours. The sixth day would involve higher overtime wage rates. A premium base rate is also paid for second-shift operators, and supervision and other overhead expenses must be increased to take care of second-shift operation. The effects of increased costs of this nature by actual factory cost accounting figures are shown in Table 5·3.

The assumed conditions are unfavorable to the point being made in that they show the maximum probable increase in unit costs. For example, a Saturday output of only 70 per cent of the output of other days is assumed. Under conditions of full employment, it is difficult to obtain a full Saturday shift in spite of the 50 per cent wage bonus. Second-shift output is assumed equal to 90 per cent of the first-shift output with the same man-hours because second-shift operators are usually less experienced than first-shift operators.

In this actual case, which is representative of a large segment of manufacturing industry, the increased unit variable cost is small compared with average unit cost. Average unit cost is still declining at maximum physical output. As has been noted before, marginal unit cost depends only on unit variable cost and is not affected by unit fixed cost.

Marginal unit cost, as it is calculated in Table 5 · 2, is the same numerically as variable unit cost.Therefore, according to Table 5 · 3, marginal unit cost increased only from 3.88 cents per lamp to 3.99 cents per lamp, while output more than doubled. This is a long way from meeting the criterion by which least cost is determined, which is equality between unit marginal cost and unit average cost. Average unit cost at maximum output, according to Table 5 · 3, is 6.02 cents per lamp.

We have in these figures of Table 5 · 3 the kind of cost information with which the factory manager is accustomed to deal. The decline in average unit cost, even at large outputs, caused by reduction in fixed unit cost, is an important factor that is always in the back of the manager's mind. The small increase in unit variable cost—and marginal cost—at outputs within the planned capacity of the plant is never a matter for concern so long as average unit cost is declining.

Plant Capacity. In the preceding discussion, plant capacity has been referred to in a number of ways such as *capacity output, normal capacity,* or *maximum capacity.* Plant capacity is not a definite output that can be accurately determined in many instances. In many kinds of plants capacity can be expressed only as some range of output that is determined by the nature of the manufacturing process or operations, by the kind of product, and by the skill and resourcefulness of management.

The nature of plant capacity is illustrated for a mass-production type of factory by the discussion of the capacity of a lamp-assembly plant in the preceding section.

In many continuous-process industries, of which oil refining and steel may be cited as examples, capacity can be determined within relatively narrow limits by the capacity of a major item of equipment. For a steel mill producing open-hearth ingots, capacity may be determined by pig-iron capacity or by the capacity of open-hearth furnaces. The capacity of plate mills or sheet mills is determined by rolling-mill capacity and also by the average length of run for the "mix" of sizes and qualities of plate or sheet rolled during the day, week, or month.

A large part of manufacturing industry, however, is neither mass-production nor process manufacturing. It can be described best as job-shop manufacturing because of the variety of products and processes involved. In these plants capacity is difficult to measure. Where a number of different products are manufactured in the same factory, capacity will depend somewhat on the actual 'mix" of the products. Capacity obviously depends on the number of days per week and the number of hours per day during which the factory is operated. Physical capacity of such job-shop plants can be determined only by actual experience, and capacity will depend on the actual "mix" of products, on the capacity of individual pieces of major equipment, and on the ability of management to overcome specific bottlenecks as they may develop.

However, it is not necessary for our present purpose to be at all precise in the determination of capacity. The dominating effect of fixed costs on average unit cost in mechanized manufacturing is so great as to cause average unit cost to decline up to and beyond maximum capacity as determined by the physical and other limitations on capacity that have been mentioned.

Equilibrium Output—Monopolistic Competition.[8] So much for the consideration of the first and simplest part of the problem: the case of perfect competition. Perfect competition, however, is obviously an unrealistic condition. Few commodities and products are completely standardized. Practically all situations outside of some natural monopolies, and those concerned with a few scarce minerals, are combinations of competitive elements and of monopoly elements. In actual markets monopolistic elements dilute competition and competitive elements check monopoly practices.

The same type of theoretical analysis has been extended to cover this more realistic—and more complicated—model which includes both competitive elements and monopolistic elements and which has been given the name *monopolistic competition*. We are still dealing with a simplified model in a static economy for which equilibrium is the attainable natural state. But we are now dealing with some degree of monopoly within the setting of a static society.

There are four principal differences between the model of monopolistic competition in a static society and the model of perfect competition with which we have been dealing.

1. The first difference is the recognition of the existence of similar but different products that compete with each other and the existence of different

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[8] The original concept and analysis of monopolistic competition was developed by Professor Edward Chamberlin of Harvard University as his doctor's thesis in 1927. This work was expanded and published as a book, "Theory of Monopolistic Competition," Harvard University Press, Cambridge, Mass., in 1932 in its first of many editions.

services connected with their sale. These competing but different products are called *differentiated products* to distinguish them from the completely standardized products of perfect competition.

2. The second difference arises from the first; it is the recognition of costs of selling: advertising, sales promotion, and direct selling. Under perfect competition, with no product differentiation, no selling effort is necessary. A wheat farmer needs no sales department. Product differentiation, on the other hand, implies competition among products and services that are similar and competitive but different. All the methods for creating and maintaining market demand for a specific brand, and for one service over another, are necessary; selling costs, therefore, are justified.

3. Under perfect competition a single market price exists for a given product throughout the entire market, and individual sellers adjust their outputs to the output that produces no profit (in excess of normal profit) and no loss at this ruling price. If, as is usually assumed, all producers are alike and have the same production-cost curve, all producers operate at this minimum profit at equilibrium.

But under monopolistic competition there may be many different market prices for differentiated products that are essentially the same and that compete with each other. Equilibrium under monopoly and monopolistic competition is entirely a matter of maximizing profit of the single seller at his own price. It is not necessary that selling prices of differentiated products be the same. They can be changed by the producer to secure a larger share of his market. Under the conditions of monopolistic competition there can be price competition (which is not possible under perfect competition), and there can be differences of profits of different producers because of differences in costs or prices for different products or services. Selling price is fixed by each producer to produce that sales volume and output that will produce the largest total profit. Producers can also compete on the basis of quality (real or merely claimed), or on customer services offered, or by sales-promotion methods. If any of these other methods of competition are used, unit prices will not be changed necessarily to secure larger output.

The major motive or incentive of a producer under monopolistic competition or under perfect competition, however, is the same: each producer attempts to maximize his own profit with reference to his own price curve and his own cost curve. The different profit and output situations are the result of the differences in market-price and cost conditions.

4. It follows from the market-price conditions of monopolistic competition that the producer has two choices. He can increase his output, possibly at the expense of his competitors without improving his product or reducing his production costs, by reducing his price below his competition. It is assumed, as with perfect competition, that no factors other than price affect

demand. As a second choice each producer can increase his output by improving his product without changing his price; his production costs may or may not be increased. Or he can increase his selling effort, also without increasing his selling price. Improving his product without increasing production costs and increasing the effectiveness of his selling without increasing his selling costs, are legitimate assumptions under monopolistic competition because differences in management ability are recognized. Each of these two choices will be analyzed in turn.

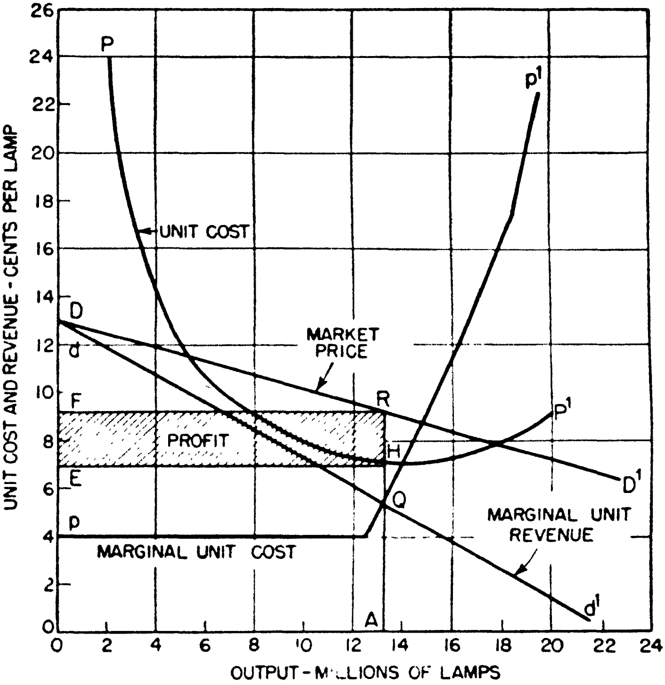

Fig. 5 • 6. Unit Cost and Revenue of a Lamp Factory—Monopolistic Competition, Decreasing Market Price, Operating at Profit

Under conditions of imperfect or monopolistic competition, the equilibrium output is reached (as with perfect competition—Fig. 5 • 3) when marginal unit cost is equal to marginal unit revenue at Q. With monopolistic competition as shown, market price is assumed to be reduced in order to increase output. Marginal unit revenue is not equal to market price as is the case when market price is not reduced to secure larger output. The difference in market price (demand schedule) is the significant difference between Fig. 5 • 3 and Fig. 5 • 6, and the reason for a lower equilibrium output under monopoly conditions.

Equilibrium Output with Decreasing Market Price—Monopolistic Competition. Figure 5 • 6 shows the price and cost relationships of the single firm under conditions of monopolistic competition and with declining market price with increasing output. It is the choice of the producer — but not his necessity — to increase his sales and output by reducing his price. Consequently, the unit-price curve DD^1 is no longer horizontal, as it was under the assumptions of perfect competition. It slopes downward. The line DD^1 also represents the firm's assumed demand schedule (as defined and illustrated in Chap. 4) for the single nonstandardized product which takes into account the competition it meets from all substitute products and from all competitive prices within its group of competitors. These conditions and the resulting demand schedule are assumed to remain constant.

The line PP^1 is the cost curve and includes costs of production and costs of selling.[9] The cost curve, as in the case of perfect competition, assumes a minimum point within the range of physical output of the plant followed by rising unit costs. The reasons for assuming a rising-cost curve and its significance are the same as those presented in the case of perfect competition.

The cost curve under the assumed conditions must intersect the market-price line at two points. If the market-price line should lie wholly below the cost curve, as it might, the product would be produced at a loss at all outputs, and ultimately the firm would disappear. Therefore, this is not a probable condition. If DD^1 crosses once, it must cross twice, "because the demand curve must fall gradually to zero, whereas the cost curve can never fall to zero, but must turn upward again after the most efficient scale of production has been reached."[10]

The lines pp^1 and dd^1 are curves of marginal cost and marginal revenue, respectively. During the analysis of equilibrium under perfect competition, nothing was said about marginal revenue because marginal revenue and market price are identical when price is constant (horizontal demand schedule). Now, however, it is necessary to deal with marginal revenue as well as with marginal cost.

Marginal revenue is the additional revenue obtained when there is a small addition to output. Marginal revenue is the sales value of the marginal product. There is a similar relation between average unit revenue (market price for the total output at any volume) and marginal revenue as exists between average cost and marginal cost, that was explained in connection with Fig. 5·3 for perfect competition.

As production is increased up to the point of the intersection of marginal cost and marginal revenue at *Q* (see Fig. 5·6), profits are increasing. Profit is the area of the rectangle *EHRF*. This is the product of unit price (*AR*) and number of units (*QA*), which is total revenue, less the product of average unit cost (*AH*) and number of units (*OA*), which is total cost. Profit is maximum at output *OA* because marginal cost and marginal revenue are equal. At any output less than *OA*, the addition of a small increment of output results in a *greater increase in revenue* than cost; at any output greater than *OA*, the addition of a small increment of output results in a *greater increase in cost.*

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[9] Chamberlain stresses the importance of treating production costs and selling costs separately. Separate treatment, howevei, leads to the same conclusions as when production costs and selling costs are combined. For the sake of brevity the analysis based on combined cost only is presented.

[10] CHAMBERLIN, EDWARD, "Theory of Monopolistic Competition," 5th ed., pp. 76–77, Harvard University Press, Cambridge, Mass., 1946.

Table 5·4. Cost and Revenue of a Lamp Factory—Monopolistic Competition—Declining Prices—Operating at a Profit

(1) Monthly output, million lamps	(2) Market price, cents per lamp	(3) Total revenue	(4) Marginal product, million lamps	(5) Marginal revenue	(6) Marginal unit revenue, cents per lamp
1	12.71	$ 127,100	1	$127,100	12.71
2	12.43	248,600	1	121,500	12.15
3	12.14	364,200	1	115,600	11.56
4	11.86	474,400	1	110,200	11.02
5	11.57	578,500	1	104,100	10.41
6	11.28	676,800	1	98,300	9.83
7	11.00	770,000	1	93,200	9.32
8	10.71	856,800	1	86,800	8.68
9	10.43	938,700	1	81,900	8.19
10	10.14	1,014,000	1	75,300	7.53
11	9.86	1,084,600	1	70,600	7.06
12	9.57	1,148,400	1	63,800	6.38
13	9.28	1,206,400	1	58,000	5.80
14	9.00	1,260,000	1	53,600	5.36
15	8.71	1,306,500	1	46,500	4.65
16	8.43	1,348,800	1	42,300	4.23
17	8.14	1,383,800	1	35,000	3.50
18	7.86	1,414,800	1	31,000	3.10
19	7.57	1,438,300	1	23,500	2.35
20	7.28	1,456,000	1	17,700	1.77

Calculation of Marginal Revenue. Table 5·4 is introduced to show the step-by-step process of calculating marginal revenue, as shown graphically in Fig. 5·6. The method is similar to that for marginal cost illustrated by Table 5·2. For Fig. 5·6, unit costs, total costs, marginal costs, and marginal unit costs are the same as shown in Table 5·2. The differences between Fig. 5·3 and Fig. 5·6 lie with market price, total revenue, marginal revenue, and marginal unit revenue.

In Table 5·4 the calculations leading to Marginal Unit Revenue, column (6), follow the same steps as for the calculation of marginal unit cost, as illustrated in Table 5·2.

Market Price at various outputs, column (2), is calculated from the formula: Market price (cents per lamp) = 13 − 0.2857 (millions of lamps). This is the equation of the assumed demand schedule for lamps. It has the same form as the demand schedules for corn in Chap. 4 (see Fig. 4 • 5). It is a theoretical demand schedule showing the change in volume with changes in price, when all other conditions of product and market remain unchanged. The price of 13 cents per lamp at zero output is fixed by the competitive market conditions of the specific lamp factory at the particular time.

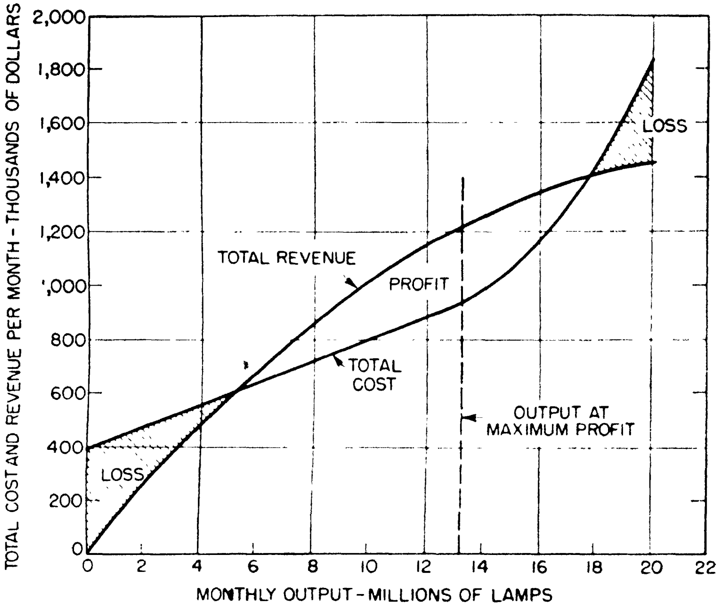

Fig. 5 • 7. Total Cost and Revenue of a Lamp Factory—Monopolistic Competition, Decreasing Market Price, Operating at Profit

This chart shows the same results under the same conditions as Fig. 5 • 6 when total costs are used instead of unit costs. As in Fig. 5 • 4, equilibrium output is reached when total cost and total revenue have the same slope—are parallel. Under monopoly conditions, profit is assumed.

Total Revenue, column (3), is calculated from column (1), Output, and column (2), Price. It will be of interest to calculate the demand elasticity of the assumed lamp demand schedule as was done in Chap. 4 for sugar and for other commodities. For a straight-line demand schedule the demand elasticity changes with price and output. In this case the demand elasticity at the equilibrium output of 13.2 million lamps is chosen for illustration.

Market price at 13.2 million lamp output:

$$\text{Market price} = 13 - 0.2857 \times 13.2 = 9.219.$$

At 1 per cent lower price (9.1268 cents) the output equals:

$$9.1268 = 13 - 0.2857x$$
$$x = 13.52 \text{ million lamps}$$

With 1 per cent decrease in price, demand (output) is increased 0.32 million lamps, which is 2.42 per cent.

Elasticity of demand at 9.219 cents (or 13.2 million lamps output) is 2.42 per cent. The demand schedule used in this example consequently has a high elasticity of demand.

Total Cost and Revenue Chart. Figure 5·7 tells the same story as Fig. 5·6 except that it shows total cost and revenue instead of unit cost and revenue. The total-cost line is identical with that of Fig. 5·4 based on perfect competition. The total-revenue line is taken from column (3) of Table 5·4.

Losses are shown at low outputs and high outputs and profits are earned at intermediate outputs from 6 million lamps to about 18 million lamps. Maximum profit is earned at an output of about 13 million lamps where tangents to the cost line and revenue line are parallel.

In this case the condition of maximum profit is reached by the cost line bending up and the revenue line bending down. Total profits increase as long as the cost line and revenue line diverge; total profits decrease as long as these two lines converge. Losses end or begin where the two lines cross.

Relative Equilibrium Outputs — Perfect Competition and Monopolistic Competition. Figure 5·3 for perfect competition shows the equilibrium output (no profit and no loss) at 14 million lamps. The corresponding chart for monopolistic competition (Fig. 5·6) shows equilibrium output (for maximum profit) at the lower output of 13 million (plus) lamps.

This decrease in equilibrium output is the result of the decreasing demand schedule assumed for the case of monopolistic competition, as compared with the constant market price (and horizontal demand schedule) that goes with perfect competition.

The demand schedule assumed in the example of monopolistic competition has a high elasticity (2.42). If the assumed elasticity of demand were lower, the demand schedule would fall more rapidly and the point of intersection *A* (Fig. 5·6) would occur at a still lower output.

The equilibrium output also depends on the shape of the marginal-cost line, but this is the same in the two examples and so plays no part in the lowered equilibrium output shown in this case.

These different revenue relationships for perfect competition (constant market price) and for monopolistic competition (with declining market price) provide the only theoretical support for the widespread belief that pure monopoly or partial monopoly (monopolistic competition) inevitably results in lower equilibrium output — that, in more popular language, *monopoly restricts production and employment* and that this happens under the dynamic conditions of actual markets.

The more practical implications of this charge of restriction against monopoly will be considered in a later chapter. Here it will be sufficient to note the assumptions on which the restriction depends:

1. That the effects of short-term diminishing returns in increasing unit costs at high outputs are large enough to overcome the contrary effects of fixed costs in reducing unit costs at all outputs and to cause a considerable increase in average unit costs and marginal unit costs at outputs within the physical capacity of the factory.
2. That the management of the business firm elects to increase output by reducing prices.
3. That price elasticity of the product is high enough to make a variable price policy effective.

Equilibrium Output with Constant Market Price — Monopolistic Competition. The producer under monopolistic competition has two choices: he can reduce his price for a given product in order to increase sales and output, or he can improve his product or service in order to increase sales and maintain a constant price. If the producer elects to hold his price constant and to increase his sales and output by other means within his control (and this is the usual practice in American industry), the equilibrium output for maximum profit is the same under this condition of monopolistic competition as for perfect competition, assuming the same market price. There is no restriction of output below the output of pure competition.

The criterion for scale of production and relative outputs under both perfect competition and under monopolistic competition is price policy (or ruling market price) rather than the nature of competitive conditions. Output restriction is generally associated with monopoly only because the usual analysis of pure monopoly and of monopolistic competition is made on the assumptions of a downward-sloping demand schedule and an increasing-cost curve.

The reader may wonder why so much space has been devoted to marginal analysis of perfect and monopolistic competition that is, at least, of questionable usefulness because of its unrealistic assumptions. The understanding of this analysis is important, nevertheless, because many economic texts present a sharply rising average unit-cost curve at high outputs as the cost condition typical of the single manufacturing firms. The assumption of an increasing-cost curve is an essential condition for equilibrium and for the conclusion, so frequently presented, that all kinds and all degrees of monopoly inherently restrict production. Without an understanding of the special assumptions and conditions that lead to this conclusion, the reader would not be prepared for the discussion of the more practical and realistic aspects of markets as discussed in Chap. 8.

Summary

The course of production depends largely on the decisions of management, and the decisions of management are motivated largely by considerations of expected profit or possible loss. This fact—the importance of the profit or loss incentive — poses a problem when the operations of the single firm under conditions of the static state and perfect competition are studied. We have learned that under these idealized "laboratory" conditions there can be no profit or loss at equilibrium. But the manager of the firm is influenced by his expectation of profit or his fear of loss to increase or decrease production. The dilemma can be solved by assuming that equilibrium is reached before *true profit* (profit over and above compensation for owner's land, capital, and services) is entirely eliminated. This minimum level of pure profit (which is sometimes called *normal profit*) is assumed to be just sufficient to keep existing firms in business, but not sufficient to attract new firms.

When an industry is in equilibrium, there is no tendency for prices or total output to increase or decrease. For the single firm and under conditions of perfect competition, the equilibrium price is the market or industry price. The single firm is assumed to be too small in relation to the size of the market to affect market price.

The equilibrium output of the single firm is that output at which marginal cost is equal to marginal revenue (as explained in Chap. 3). The final or marginal unit of output adds as much to cost as it adds to revenue.

Marginal unit cost intersects the curve of average unit cost also at the minimum average unit cost. This is so because as long as marginal cost (the cost of the last unit added) is less than average cost, average cost declines; when marginal cost is equal to average unit cost, average unit cost declines no longer; and when marginal cost exceeds average unit cost, average cost is bound to increase.

Equilibrium output also can be determined from total-cost relationships instead of from unit costs. Equilibrium output is that output at which total revenue is equal (and tangent) to total cost (see Fig. 5·4).

Marginal cost is equal to marginal revenue, and equilibrium exists when the total-revenue curve and total-cost curve are parallel (see Fig. 5·5).

A state of equilibrium is possible only when there is a rising average-cost curve with increasing outputs at the upper range of output and a sharply rising marginal unit cost. Otherwise, the marginal unit-cost curve will not intersect the average unit-cost curve. Equilibrium is attained only when marginal unit cost intersects the average unit-cost curve, and this can happen only with a U-shaped average-cost curve.

Average unit-cost curves that are typical of modern manufacturing and that determine the thinking and policies of managements, are flat or decline gradually up to capacity output. Consequently, there is no point of stable equilibrium in the typical manufacturing plant. Management finds its maximum profit at maximum possible output — not at some output below capacity.

Perfect competition, like perfect monopoly, is rarely, if ever, found in actual industry. Professor Chamberlin suggested a model in which both competitive and monopoly elements could be considered at the same time which he called monopolistic competition.

The four principal differences between monopolistic competition and perfect competition are:

1. Competitive products are similar but different.
2. Because there are differences among products, selling effort is worth while and costs of selling are recognized in the analysis.
3. Selling prices of different products in competition are not necessarily the same.
4. Under monopolistic competition the producer has two choices in order to increase his output: he can reduce his price or he can maintain a constant price and increase selling costs or change his product to give it greater sales appeal.

When the producer reduces his price to secure greater output, the equilibrium output occurs at a lower value than with the constant market price of perfect competition. For example, with perfect competition the equilibrium output of the lamp factory in Fig. 5·3 is 14 million lamps per month; with monopolistic competition and the assumed demand schedule, the equilibrium output is 13 million lamps per month (see Fig. 5·6).

This difference in output when output is increased by price reduction is the basis for the widespread belief that monopoly of any kind restricts production. But when the producer elects to increase output by means other than price reduction, the equilibrium output is the same under either monopolistic competition or under perfect competition, assuming the same market price.

Review Questions

a. With millions of independent manufacturers, farmers, distributors, and retailers all making their individual plans for the amount and kinds of goods to be produced and sold, what factors and forces in the system of private capitalism organize production into a coherent and balanced program?

b. Do you think the American system leads to a better or worse fulfillment of consumer needs and desires for goods and services than would an equally productive system in which the quantities and kinds of goods to be distributed were determined by a national planning organization?

2. *a.* What factors determine the equilibrium output and price level of an *industry* under static conditions and for the short term?
   b. What factors determine the equilibrium price and output of an *individual firm* when the industry is in equilibrium?

3. *a.* In the distribution of electric refrigerators and other consumer equipment, it may be the practice for a manufacturer to agree with a local distributor that the manufacturer will advertise his product locally up to a cost of so many dollars for each refrigerator sold. Does this local advertising constitute a fixed cost or variable cost for the manufacturer? Would your answer be the same if the agreement provided for the expenditure of a lump sum for local advertising?
   b. How then are fixed costs to be distinguished from variable costs for a single firm and for relatively short periods?
   c. How do fixed costs and variable costs each affect *total* costs of the firm's output over the full range of output?
   d. How do fixed costs and variable costs each affect unit costs of a firm manufacturing a single product over the full range of output?

4. Calculate total cost and unit cost for an automobile manufacturer at outputs of 10,000 cars per month, 16,000 cars per month and 20,000 cars per month when the fixed cost (for the budget period) amounts to 8 million dollars per month and variable cost per car amounts to $1,000 per car.

5. *a.* Calculate marginal unit cost and average unit cost for the automobile plant of Question 4 when variable costs per car change with output as follows:
   1. Up to 10,000 cars per month, $1,000 per car;
   2. Between 10,000 and 15,000 cars pe month gradually increasing to $1,100 per car;
   3. At 16,000 cars per month, $1,130 per car;
   4. Then gradually increasing to $1,350 per car at 20,000 cars per month;

   Assume operation at constant equilibrium price and perfect competition.
   b. What is the equilibrium output (cars per month) under the above conditions?

6. Assume that $1,500 per car is the f.o.b. market price of the car produced under the cost conditions of question 5 and perfect competition. What changes in cost conditions would be necessary in order that the car can be produced without loss when the factory is operating at the minimum average-cost output?

7. What changes in cost conditions of the automobile factory of question 5 would be logical and necessary so that the equilibrium output will be close to the capacity output of 20,000 cars per month for which the factory was designed and is equipped?

8. Which cost conditions do you think are closer to actual industry practice: the cost conditions of question 5 or those you recommended in question 7?

9. *a.* Assume the same cost conditions as in question 5 and calculate the equilibrium output (for maximum profit) under conditions of monopolistic competition. Output is increased up to the equilibrium output by reducing the price of the automobile as determined by a known demand schedule. Assume the demand schedule to be defined by the equation:

Market price = \$2,400 — 0.03 (number of automobiles produced per month)

b. What is the elasticity of demand for this demand schedule at a market price of \$1,800? At \$1,600?

10. Assume the same conditions as in question 9 except the demand schedule is defined by the equation:

Market price = \$2,400 — 0.05 (number of automobiles produced per month)

a. How does this different demand schedule affect the equilibrium output?
b. Is the market of question 10 more or less elastic than the market of question 9?

11. *a.* Based on your answers to questions 5, 9, and 10, in what way does the elasticity of demand of a market affect the equilibrium output?
b. In what way, then, does the elasticity of demand of a specific market affect the manufacturer's ability to increase output by reducing price even under conditions of perfect competition?
c. Can you suggest one or more deductions of practical importance to management based on your answers to 11*a* and 11*b*?

12. *a.* What would the equilibrium output be under the conditions of question 9 except that the automobile manufacturer maintains a constant market price of \$1,800 at all outputs and increases his output to the equilibrium output by competitive factors other than price, such as better than competitive performance, less maintenance costs, better service facilities?
b. How does this equilibrium output compare with the equilibrium output of the same manufacturer if he were selling in a market of perfect competition instead of monopolistic competition: when the free market price (perfect competition) is \$1,800 and when the free market price is \$1,600?

6. THE THEORY OF WAGES

The theory of wages is an important part of the theory of distribution of the market value of the product to the different factors of production. Labor and wages of labor present some of the most difficult and interesting problems of economics in both theoretical and practical fields. Labor is the only factor of production that will be given extended treatment in this volume under both static and dynamic conditions. Of the other factors and and their compensation, the economists' conception of pure profit (as compensation of management) was explained in the preceding chapter. Interest (as compensation for the use of capital) will be taken up under dynamic conditions in the chapter dealing with investment. Rent will appear only incidentally in the present chapter and not at all in our study of the dynamic society. Land and natural resources in an industrial society—are most realistically treated as a part of the costs of production.

In the present chapter we will deal with the theory of wages under the simplified conditions of the static model and within the assumptions of perfect competition. In a later chapter the discussion will be extended into the more complicated dynamic society of actual industry. This discussion of the theory of wages under static conditions will provide another example and application of the important principles of diminishing returns and of marginal analysis.

Wage Theory and the Theory of Value. The theory of wages is closely associated with the theory of value. A wage is the price of labor and, with important qualifications, behaves as prices behave in a perfect market. Also, since wages are an important cost factor, wages are related to market prices. The wage rate in a static society under conditions of equilibrium depends on the two factors: on the quantity of goods produced (by one man in one hour) and on the relative prices of different goods—on the values in exchange.

Under the prescribed conditions, if a group of craftsmen in one industry increases its production while production in all other industries remains unchanged, then the greater production of the first industry serves to lower its price. The workers who produced more may be no better off in spite of their greater contribution. The theory of wages concerns value (price) as well as production.

Wage Theory and the Theory of Distribution. The theory of distribution teaches that the income shares of land, labor, capital, and management are interrelated. With constant output, if capital (in the form of machinery) is increased, the quantity of labor is generally reduced in some relation to the increased investment. In manufacturing, land and other natural resources are used only in quantities required by the quantity and kind of product. Even in agriculture with a given kind and method of farming, capital and labor are used in some economical relation to the amount of land.

If wages are high in relation to other prices, farmers cannot afford to cultivate poor land or cultivate good land as intensively. In countries where wages are relatively low, it is difficult to offset the cost of mechanization by reduction in cost of labor, particularly if capital is scarce and high-priced. As wage rates go up in countries where capital is plentiful, more capital and less labor will be used.

There are thus four factors that determine the real income share of any of the agents of production:

1. The physical volume of production available for distribution;
2. The distribution of the value of the product among the several agents of production according to their contributions;
3. The relative exchange value (prices) of different products;
4. The relative costs of different factors that influence the proportions of the factors that are used.

Classical Wage Theory. The early classical economists—and especially Malthus and Ricardo—arrived at a purely subsistence theory of wages. It was believed that the food supply controlled population and the size of the labor force, and that food supply determined the wage scale. The supply of labor would continually press on the food supply—as it does today in a large part of the world. It was believed that money wages rose and fell with the cost of bare subsistence, of which food was the most important element, but that real wages, measured by the food and other necessities that the money wage would buy, could not be increased. If real wages tended to increase, the birth rate would increase or the death rate would fall. The supply of labor, therefore, would increase and real wages would fall. Apparently, the time lag of a whole generation between cause and effect and the existence of other factors affecting the birth and death rates did not bother these early theorists too much. In justification of the soundness of their reasoning, however, the survival chances of more than half of the people now living in the world do depend on the food supply; population does press on subsistence; and the mass of the people live under the constant threat of hunger. Malthus and Ricardo could not have foreseen the immense increase in productivity that has occurred throughout the Western World that has enabled some small part of the people in the world to escape the fate they predicted.

The subsistence wage theory was seized upon by the owners of the new factories during the early decades of the Industrial Revolution to justify the lowest possible wage scale—a scale just sufficient to sustain life and to maintain the size of the working population. Factory owners, supported by current economic thinking, justified subsistence wages because they believed that higher wage levels would be impossible to maintain over the long term. They believed higher wages would do labor no good; they would lead to extravagance and to larger families that could not be supported. Poverty was the fault of the working people (and of their parents). In another way—especially for England—higher wages, so the argument ran, would be self-defeating. Higher wages would increase production costs and cause a decline in exports and in the demand for labor. There would be a decline in employment, and consequently a decline in wages. To the early English economists low wages seemed to be a natural condition of labor and nothing could be done about it!

David Ricardo (1772-1823) justified and rationalized the early classical theory. Ricardo was a highly successful stockbroker, financier, and landowner, who through his own ability became one of the wealthiest men in Europe. Also, by reason of his intellectual powers and business experience, he became one of the greatest of the early classical economists.

Ricardo recognized the growing importance of man-made forms of capital as factors of production and the growing importance of manufacturing in England. In spite of the fact that much of his personal fortune was invested in land, he believed that the future of England depended more on manufacturing and foreign trade than on agriculture. And because he believed with his times that the level of real wages (in terms of the cost of subsistence) depended mainly on the cost of food, he advocated measures that would reduce the cost and price of food, and thereby reduce the money wage level. According to Ricardo, high rent retained by landowners as their share of production increased the price of food. What the landowner gained, some other factor of production lost. Ricardo lived under conditions much closer to those of the static society than we do today, and his thinking on questions of public policy (to be applied to current problems) was in terms of a static society. The wage earners could neither gain nor lose (under current wage theory) because the real wage scale was fixed by the cost of subsistence. If the cost of food increased, money wages increased;

the workers were no better off, but the manufacturers were faced by higher money costs in relation to prices in foreign markets. Higher costs would tend to reduce foreign orders, so in the end both factory owners and factory workers lost income and employment. So Ricardo advocated cheap food and that would lead, in his thinking, to lower money wages (without changing real wages), lower costs, larger profits for more capital accumulation, more foreign trade, more factories, and more jobs.

There was little progress in the general acceptance of a more enlightened wage theory until the early years of the present century. As late as 1860, Lassalle, the founder of the German Social Democratic party, coined the phrase—"the iron law of wages"—referring to the subsistence theory of wages.

During the latter half of the nineteenth century the prevailing theory of wages followed the simple theory of value applied in a static society and under the assumptions of perfect competition. It was clearly described in a small primer on political economy written in 1878 by William Stanley Jevons, who is generally rated as among the first five English economists of the classical school.

> The rates of wages in different employments are governed by the laws of supply and demand. . . . Just as goods rise in price when there is little in the market and much is wanted, so the price of men's labor rises when much of any particular kind is wanted and little is to be had. It does not matter much whether we speak of demand for goods or demand for the labor which is necessary to make the goods. If more things of a certain sort are wanted, then more men able to make them must be found.

After discussing the demand for and the supply of aneroid barometers as an illustration, Jevons concludes:

> Thus demand for commodities comes to nearly, though not quite, the same thing as demand for labor. There is the profit of the capitalist to be considered as well, but with this exception: rates of wages are governed by the same laws of supply and demand as the prices of goods.[1]

A more recent exposition of the same classical theory is contained in an address by Ludwig von Mises, an economist of the orthodox school:

> On an unhampered labor market, wage rates are fixed by the interplay of demand and supply at a level at which all those eager to work can finally find jobs. On a free labor market, unemployment is only temporary and never affects more than a small fraction of the people. There prevails a continuous tendency for unemployment to disappear.

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[1] JEVONS, W. S., "Political Economy," pp. 56–57, Appleton-Century-Crofts, Inc., New York, 1888.

Dr. Mises goes on to discuss the effect of wages higher than this equilibrium rate. Wages higher than the natural rate cause unemployment or lower wages in other parts of the labor market. Then he says:

> But if fixing of wage rates above the potential market level becomes general, workers losing their jobs cannot find employment in other branches. They remain unemployed. Unemployment emerges as a mass phenomenon prolonged year after year.[2]

Wage Theory and Marginal Productivity. We have seen wages explained by the cost of the necessities of life; then by the operation of the law of supply and demand and the equilibrium wage; the third important development in the theory of wages was the application of the principle of marginal productivity.

The American economist John Bates Clark was one of the leaders in the use of this new analytical tool. He clearly limited his analysis to the static model — a limitation that Jevons and Dr. Mises, in common with many others, failed to stress. Clark described his model society as the kind of society that would exist "if labor and capital were to remain fixed in quantity, if improvements in the mode of production were to stop, if the consolidating of capital were to cease, and if the wants of consumers were never to vary."[3] This will be recognized as a static society. We will study this static society while it is in a transitional state. The quantity of labor is fixed, as stated, only after equilibrium is established.

Clark set out to show how in this society the value (price) of labor is ultimately fixed when equilibrium is reached by the value of the marginal product produced by the last unit of labor employed, assuming a fixed amount of capital.

Clark imagined an isolated community that possessed 100 million dollars of capital and a "corresponding" labor force:

> Put a thousand laborers into the rich environment that these conditions afford and their product per capita will be enormous. Their work will be aided by capital to the extent of a hundred thousand dollars per man. This sum will take such forms as the workers can best use and a profusion of the available tools, machines, etc., will be at every laborer's disposal. . . . Add, now a second thousand workers to the force and with the appliances at their service changed in form — as they must be — to adapt them to uses of the larger number of men, the output per man will be smaller than before. This

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[2] From a speech to the American Academy of Political and Social Science, Philadelphia, Mar. 30, 1945, The Myth of Mixed Economy, printed in *American Affairs* of July, 1945, published by the National Industrial Conference Board, Inc., New York.

[3] CLARK, J. B., "The Distribution of Wealth," pp. 174–177, 1899, quoted by Paul Douglas, "The Theory of Wages," p. 39. Copyright, 1934. Used by permission of The Macmillan Company, New York, publishers.

> second increment of labor has at its disposal capital amounting to only half a hundred thousand dollars per man, and this it has taken from the men who were formerly using it. Where one of the original workers had an elaborate machine, he now has a cheaper and less efficient one, and the new workers by his side also have machines of the cheaper variety. This reduction in the efficiency of the instrument that the original worker used must be taken into account in estimating how much the new worker can add to the product of industry.

Because of the addition of the second group of workers each of the total number of workers

> brings into existence less wealth than did one of the first division of laborers . . . the product that can be attributed to this second increment of labor is, of course, not all that it creates by the aid of the capital that the earlier division of laborers has surrendered to it; it is only what its presence adds to the product previously created. With a thousand workers using the whole capital, the product was four units of value; with two thousand, it is four plus; and the plus quantity, whatever it is, measures the product that is attributable to the second increment of labor only.

Two thousand men will produce more than 1,000 men, but not twice as much.

It will be noted that Professor Clark's "plus quantity" is the marginal product. It is the increment of product resulting from the addition of another unit of labor, all other factors remaining the same. Then more and more increments of labor are added to the same original amount of capital. Each increment of labor produces a smaller increment of value; the marginal product declines with each added increment of labor. For example: 1,000 men may produce 4,000 units of product; 2,000 men produce 7,000 units. The average production per man is 4 units for the first group and 3.5 units for the two groups. But the marginal product per man of the second group is 3 units. When a third group of men is employed, the total output of 3,000 men is, say, 9,000 units. The average output per man of the entire force is 3 units. But the marginal product of the 1,000 men of the third group is the smaller amount of 2 units per man.

Finally, the supply of labor—at the equilibrium wage—is exhausted. The final division of 1,000 men has created its own increment of value. This is less than that of any earlier division, but now that this final division is in the field, no other division is worth any more than this final division. This statement may require explanation and we will come back to it.

At equilibrium the natural wage rate is such that the cost of the final increment of labor—the marginal cost—is equal to the marginal revenue. Or the wage rate per hour is the market value of the marginal product of one man working 1 hour. This will be recognized as the condition for equilibrium output in the operation of the single factory in Chap. 5. Unit marginal cost is equal to unit marginal revenue which is market price.

But what determines that there will be one division of 1,000 men which will be the last? Is it not conceivable that the process that has been described could go on until the marginal product and the wage rate were both zero, if the supply of workers held out?

It does not go on in this fashion because the process is stopped by competition of other employers in the same labor market for workers from a limited supply of labor. Workers will apply for jobs in this theoretical community only as long as that community's value of marginal product exceeds the equilibrium level of the labor market of which the model community is a part. Or to consider a smaller unit, workers will transfer from factory A to factory B just as long as the marginal product of factory B exceeds that of factory A. Workers will flow into the community until the decline in marginal product and the decline in the wage scale of the model community is stopped by the competition of other employers in the same labor market.

The wage scale of the theoretical community cannot go below the wage scale established by other employers competing for labor in the same labor market. With the assumption of perfect mobility of labor (*i.e.*, no cost of moving labor from one job to another), all employers within the same market are "competing employers." It follows that all employers without regard to industry, occupation, or trade, would come to the same common level of marginal productivity and wage scale when equilibrium is achieved. More specifically, the marginal productivity and wage scale of the least productive farm in use would be the same as the marginal productivity and wage scale of the most productive automobile factory, steel mill, or chemical plant, but only, it should be remembered, under the conditions of perfect competition.

Two separate forces combine to bring this about. During the transition period leading to equilibrium, workers leave the firms and industries having lower marginal productivities and wage scales and join the firms and industries with the higher marginal productivities and wage scales. This transfer of workers serves to raise the low wage scales and to lower the high wage scales, and as long as any differences exist, the transfer process continues. At the same time the larger working force in the high marginal-productivity firms and industries increases production and lowers the market price, which, in turn, lowers the market value of the marginal product. The reverse behavior occurs in the firms and industries having initially the low marginal productivities and wage scales. And this process also goes on until the same marginal value and wage scale is reached in all firms and industries competing in the same market. So in the end as a consequence of the flows of workers and of market prices from higher to lower levels, all marginal-product values and all wage rates ultimately reach one equilibrium level. In this static model, in which complete equilibrium is attainable, and in which the market is indifferent to the quantity or the variety of the goods produced, the last farm laborer employed and the last automobile factory worker employed would produce the same market value of product and would receive the same wage.

This leveling process may be compared with the action in a number of tanks resting on the same floor and containing water at different levels. Each tank represents a separate nearby community or employer. If the tanks are connected by ample pipes, water flows from the higher level tanks to the lower level tanks until the water in all tanks is at the common equilibrium level. When all employees have reached a common level of value of marginal product and of wage scale, no worker can improve his condition by changing employment, and no employer can improve his position by increasing or decreasing his output. When the water in the several tanks has reached the common equilibrium level, there is no further flow of water from tank to tank.

In this analysis all workers are treated as identical and all workers have the same ability, the same marginal productivity, and the same wage scale.

There is no difficulty, however, in extending the analysis to cover different classifications of workers with different skills and earning power and in assuming that each classification of worker constitutes a separate labor market with its own marginal productivity and wage scale. Differences in wage scales among different workers in the same community or in the same plant are explained by their different values of marginal product.

We return now to the point that was passed over: that the final group of workers employed having the lowest marginal output, marginal revenue, and earned wage rate is the group that determines the wage rate of the entire labor market.

The essential point is that this is true only at equilibrium. Under the condition of equilibrium, marginal unit cost is equal to marginal revenue which is unit market price, and also marginal unit cost is equal to *average* unit cost.[4]

Marginal revenue (unit market price) multiplied by the number of units produced per hour is equal to the compensation (per hour) for all the factors of production. Then the wage rate is some fraction of the market value of production per man-hour. Then the wage rate is the same fraction of marginal unit cost *and of average unit cost.* There is no mental hazard in this last statement. The whole point is that *at equilibrium* marginal unit cost and average unit cost are equal.

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[4] Refer to Chap. 5, pp. 94–95.

In the numerical example given for Professor Clark's model (page 120) for marginal product and average product, marginal product is lower than average product. But as labor groups are added, these two figures approach and at equilibrium they are equal.[5]

Wages and Aggregate Employment. Orthodox classical theory, as has been explained, assumes that full employment is the natural state and that unemployment is a transitional state of maladjustment due to frictions in markets, wage rates, mobility of labor or capital. Orthodox theory assumes that price alone in commodity markets or the wage rate alone in labor markets determines the level of sales or employment. Any volume of goods can be sold at the right price; any number of workers can be employed at the right wage. The right price always clears the market. If, however, wage rates are controlled more or less rigidly by government laws or by labor-union pressures and the established scale is higher than the equilibrium scale of perfect competition, then the available supply of labor will not be fully employed. If the controlled wage scale is higher than the equilibrium scale for a large part of the labor force, and this condition is long continued, mass unemployment will be the result.

The only remedy for mass unemployment that orthodox theory offers is the impossible one that the wage rate fall as far as may be necessary, that imperfect markets be made perfect — that markets be completely open, unhampered, and free. This orthodox remedy for unemployment is possible and effective only under the conditions of the static society.

There is some truth and common sense in the proposition that the right wage will cure unemployment, but it is not the whole story. Unemployment was undoubtedly increased and prolonged during the 1930's because wage rates were deliberately increased in the face of declining general demand, but it is at least equally probable that completely fluid wage rates and prices would not have cured the depression and eliminated mass unemployment, as they would have done if wage rates and prices had been able to fulfill the important roles assigned to them by the simplified orthodox theory.

The publication of Lord Keynes's "General Theory of Employment, Interest and Money" in 1936 emphasized this weakness of the classical position and over the past 10 years has completely changed the scientific, governmental, and popular attitudes toward mass unemployment. It is no longer possible for an acceptable wage theory to ignore the possibility of serious and prolonged unemployment as classical theory did for so many years.

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[5] J. R. Hicks, a contemporary English economist, makes this sensible observation concerning the application of the marginal theory to actual wage rates: "This Law of Marginal Productivity is regarded by most modern economists as the most fundamental principle of the theory of wages. Nothing will be said [in his book] to contradict that view. Nevertheless, care has been taken in framing . . . the law to bring into clear relief the extremely abstract assumptions on which alone it is rigorously true to say that wages equal the marginal product of labor. A long road has to be travelled before this abstract proposition can be used in the explanation of real events" (J. R. Hicks, "Theory of Wages," pp. 9–10. Copyright, 1932. Used by permission of The Macmillan Company, New York, publishers.)

At this point in our studies only the influence of Lord Keynes's ideas on the effect of wage rates on aggregate employment will be considered. The much greater contributions he made to the theory of the behavior of aggregate income, consumption, and investment will be covered in later chapters.

In the field of wage theory, Lord Keynes's contribution is still a matter of controversy. Lord Keynes did succeed without question in convincing economists of all schools that permanent unemployment should be given serious study and that theory should recognize underemployment as a permanent state and a condition of practical equilibrium, even if it could not be proven that it could exist under the simplified condition of equilibrium under perfect competition.

Lord Keynes also directed attention to the dual nature of wages. Orthodox theory stressed the role of wages as payment to one of the factors of production for its contribution to production and as a cost of production. Keynes stressed the role of wages as income to workers as well. Lower wage rates would reduce costs and prices and so increase output, but, Keynes insisted, lower wage rates would also reduce income and so reduce aggregate demand. If all personal income were received in the form of wages and salaries, a reduction of, say, 10 per cent in wages and salaries would reduce costs 10 per cent, but would also reduce income 10 per cent and prices would fall 10 per cent. Real wages cannot be reduced under these assumed conditions by a reduction in money wages.

Wage theory in relation to mass unemployment continues a matter of controversy because of the confusions inherent in an attempt to apply the conclusions of static theory to the problems of a dynamic society. It is impossible to reconcile Say's law and the principles of the static society with the existence of mass unemployment. It is difficult to explain equilibrium short of full employment as Lord Keynes attempted to do. Lord Keynes abandoned Say's law of markets — the basic classical theorem that production creates its own demand — but he did not abandon the model of perfect competition and the mechanics of static equilibrium. Consequently, he was led into devious paths in attempts to explain how equilibrium could exist in a perfectly fluid market short of full employment.

Lord Keynes proved, to his own satisfaction at least, that a reduction in *money* wages would not increase employment under conditions of perfect competition and that real wages could not be changed by a change in money wages (for the reason previously given). But Keynes also held there were so many other conditions (in actual industry) that affected the relationship between wage rates and employment that one could decide neither that employment would go up nor go down with a change in the wage level. "There is no simple rule, such as the classical economists envisage, relating the level of employment to the money wage."[6]

What has given Lord Keynes's work its great importance is that he went on from this point to answer the practical question: What is it that does determine the amount of employment? The fourth part of this book is devoted largely to the answer to this important question. It stems to a considerable extent from Keynes's work in this field. One does not have to agree with Keynes's major policy recommendation for the cure of mass unemployment (which was government deficit spending and investment), to recognize and value the outstanding contributions he made to economic thinking and to the treatment of unemployment in economic theory.

Summary

The theory of wages is a branch of the theory of distribution — the distribution to labor of its share of production. As such, the theory of wages is an application of the principles of diminishing returns and of marginal productivity. The theory of wages is also closely related to the theory of value because a wage rate is a price.

The early classical economists developed a wage theory that leads to the pessimistic conclusion that wage rates naturally fall to a bare subsistence level, and that nothing can be done to improve labor's economic position. This theory was replaced — toward the middle of the nineteenth century — by pure value theory: that wage rates are controlled, as commodity prices are controlled under the conditions of perfect competition, by the law of supply and demand.

Then this simple and inadequate theory was supplemented — but not replaced — by a theory based on the principle of marginal productivity: that wage rates are determined by the principle that the wage cost of the marginal product is proportional to the marginal revenue. Total marginal unit cost is equal to marginal unit revenue.

The classical wage theory leads to the conclusion that there can be no mass unemployment on a free labor market; unemployment is only temporary and never affects more than a small fraction of the people. There prevails a continuous tendency for unemployment to disappear. This is a logical deduction from Say's law of markets.

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[6] From an article by Professor Abba P. Lerner in the *International Review*, and reprinted in "The New Economics," pp. 113–132, edited by Seymour E. Harris, Alfred A. Knopf, Inc., New York, 1947.

Classical theory offers no remedy for the mass unemployment that does exist during depression except that labor markets be made frictionless and perfect in all other respects.

Lord Keynes stressed the need for an adequate wage theory that accounts for a state of stable equilibrium in which less than full employment can exist. Lord Keynes's own contribution to wage theory is still a matter of controversy, and it is doubtful whether an equilibrium without full employment can be logically explained in terms of perfect competition. Lord Keynes did succeed in convincing economists of all schools that wage theory should give more adequate attention to the social problem of mass unemployment.

Lord Keynes also emphasized the dual nature of wages. Wages are production costs — payments to one of the factors of production; they are likewise incomes received by an important group of consumers.

Review Questions

1. What are the major features of each of three different historical explanations of the determination of wage rates and the relation of wage rates to aggregate employment?

2. Assume a plant manufacturing chinaware with fixed capital equipment designed to produce 30,000 pieces per week when 100 men are employed.
   Assume further that in starting up the plant men are hired in groups of 10 each in successive weeks. At the end of each week, when the new men are reasonably skilled in their duties, total output per week is at the rate shown in the following table:

Week	Total number of men at work	Total output per week, in pieces of china
1	10	1,000
2	20	3,000
3	30	6,000
4	40	10,400
5	50	16,000
6	60	21,600
7	70	26,600
8	80	28,800
9	90	29,700
10	100	30,000

   a. Calculate average output per man-week, total marginal product, and unit marginal product (per man-week) for each number of men at work.
   b. At what number of men at work and total output is the output at the equilibrium value? What factor determines the equilibrium wage rate?

3. Assume that the average market price of the chinaware produced in this factory is 30 cents per piece. This price is the price determined by total market demand and

total market supply in the local market under conditions of perfect competition. What is the equivalent wage rate per week for this factory at equilibrium output, assuming that wage costs amount to 50 per cent of total product cost?

4. Assume that the equilibrium wage rate of question 3 is: (*a*) above the going wage rate for the same class of labor in the local market, and (*b*) below the going wage rate. What will tend to happen under each condition?

5. Suppose over-all equilibrium of output, employment, and wage rates has been established in the local market. Thereafter, the chinaware factory of question 2 increases marginal product per man-week without increasing or making any major changes in equipment. Marginal output per man is increased by greater skill and dexterity of the workmen and by more convenient arrangement of the equipmnt and by more convenient handling of the raw materials. What would tend to happen to output, employment, and wage rates in this chinaware factory under the new conditions? Would these trends be conducive to further increases in marginal product per man? Would you conclude that this behavior of production under conditions of perfect competition is beneficial to society?

6. *a*. Would mass unemployment such as existed in the United States during the 1930's be likely to happen under conditions of perfect competition?
   b. Would perfect competition, assuming it could be established in actual industry, be a desirable solution for depression unemployment?

PART THREE. The Dynamic System; The Conditions for Progress

7 THE DYNAMIC SOCIETY

Thus far we have been discussing exchange and production under the relatively simple conditions of the static state and where intelligence, fairness, and good will govern human relations. Static theory has been extended and elaborated much farther than it has been possible or profitable to carry it in this elementary text, but these extensions, however far they may be pushed, still deal with the static state without change and without uncertainty and without progress. Refinement of static theory offers little additional help in our search for a better understanding of the operations of our actual American system of private capitalism.

These conditions of the static state are, as we have discovered, a long jump from conditions in the real world. We can shorten the gap—although it never can be closed—by introducing a laboratory model in which the important factors of change and uncertainty are included. We must, however, continue to idealize human conduct to the extent that men act logically, in so far as they possess the necessary facts, and act in their own best interests and with justice to others. It is still necessary to assume that men in their economic affairs react intelligently to the economic circumstances in which they find themselves and that they possess the virtues of the completely moral man.

The dynamic state is marked by continual change in the organization and methods of production and in the form of capital—in the form of the tools and equipment of production. Because of constant change there is continual uncertainty. There are risks that cannot be measured or insured against, and because of uncertainty and uninsurable risks, the possibility of pure profit is present. In the dynamic state the opportunity for profit provides one of the strongest incentives for economic progress. It is possible in a dynamic society for individual entrepreneurs and individual business firms to earn profits by superior intelligence, judgment, and skill, and to *create* wealth and accumulate capital without taking it away from others. It is necessary for progress that profits be earned and capital accumulated. The rapid accumulation of capital by individuals and individual business firms is the basic requirement for rapid economic progress in our system of private capitalism.

Because of all of these characteristics of the dynamic state, the functions of the entrepreneur, the professional manager, the scientist, the inventor, the innovator, technicians of all kinds, become highly important. These superior people have no important role in the static society of perfect competition.

We will find that in exchanges in the idealized dynamic state, that is also a progressive society, there is a highly effective and desirable combination of competition and nonrestrictive monopoly; there should be enough competition to promote efficiency—to stimulate economy in the use of resources and to limit unearned and undeserved pure profit, and enough monopoly—enough control over market price and market supply—to encourage the introduction of new and improved products, new inventions, improved methods of production, new types of production equipment, and to develop new and larger markets. There should be some degree of competition and some degree of monopoly in the progressive, dynamic state; but not enough of either to endanger progress on the one hand or efficiency on the other.

Another important difference between the dynamic state and the static state is the possibility, in the former, that the principle of diminishing returns can be made inoperative by improvements in the methods of production. The principle of diminishing returns—so necessary for the attainment of equilibrium in the static state—is of little importance over the long term in the dynamic society. The principle of diminishing returns can operate in the dynamic state only when change is absent and then the dynamic state is no longer dynamic. Under intelligent and skillful management change leads to increasing returns with the use of more and more capital per worker. Increasing returns for each dollar of capital and for each worker are the hallmarks of the progressive, dynamic state.

Equilibrium is the normal condition of the static state; continual change—for better or for worse—is the normal condition of the dynamic state. The principle of diminishing returns is an essential element of the static state because without it equilibrium can never be reached. The principle of diminishing returns must be overcome and replaced by the principle of increasing returns in the *progressive,* dynamic state.

There is still another difference between the static state and actual industry which has been frequently emphasized in the development of economic theory, but which is not nearly so significant as the differences connected with uncertainty and change that have just been discussed.

It is frequently stated that the chief reason why actual industry does not behave as indicated by static theory is to be found in the frictions that exist in the real world. If, for example, commodity prices responded instantaneously and perfectly to changes in supply and demand; if there were no monopolistic restrictions to control market price and supply; if labor supply and labor rates were perfectly fluid, then actual markets would behave as theory indicates they should behave. There would be no unused resources and no permanent unemployment. The actual economy would be, except for brief periods of transition, in equilibrium at full employment.

But, according to this view, because of frictions in the real world, the economy never reaches equilibrium. The economic forces are present but are not strong enough or act too sluggishly to bring the economy into equilibrium before new conditions arise that start the economy on its way to a new state of equilibrium, which, again, is never reached.

There is some measure of truth in this picture of an actual economy that differs from the static economy and perfect competition mainly, if not entirely, in the relative weakness and sluggishness of its competitive forces. But the really significant difference between the actual economy and the static state is to be found in another area. It is the difference in the kind of forces and incentives that are present in the dynamic society: the opportunities and incentives provided by uncertainty, by changes in methods of production, and for the accumulation of capital.

We can never achieve a wealthy, progressive society merely by removing frictions from our present society, with the perfect fluidity of a static society as the ideal. For progress we need the different and positive forces and opportunities that characterize a dynamic society.

The Accumulation of Capital. Because of the importance of the accumulation of capital to progress in a dynamic society, it is desirable to know just what the economist means when he refers to wealth and to capital.

Wealth is any material thing produced by labor from land or other natural resource.

Capital is wealth which is saved and used in producing other wealth.

For innumerable centuries before the Industrial Revolution, man's ability to produce wealth remained distressingly small. There had never been enough produced in a year to remove the annual threat of starvation from more than a microscopic fraction of the people of the world. For centuries on end the store of capital increased slowly, if at all. Population also increased slowly. But as sources of mechanical power multiplied manual power, as power-driven tools were invented, and as more and more raw materials were made available, man's ability to produce and to save out of production began to accelerate. Man's store of capital began to multiply. The population of the Western World doubled within two centuries.

Wealth, Capital, and Productivity. The ability of any economic system—whether it be British Socialism, Stalinist Communism, or American Capitalism—to produce, to accumulate capital, and to support a large population on a high plane of living depends basically on how fast its industry can produce—on its rate of production or productivity. Every economy and every worker in the economy possesses 24 hours a day and 365 days in the year. How well the worker and his family can live depends primarily on how fast time can be converted into wealth and the services necessary for comfortable living. If the average worker can produce quickly—can produce a large quantity of goods or services in an hour, a day, or a year—the community can enjoy a high income, can accumulate capital, and can accelerate its rate of production. If the typical worker in a community can produce little in an hour, there will be general poverty, little capital can be saved, and material progress will be slow or absent.

Facts and figures will be marshaled as we proceed to show that there is a close relationship between a high plane of living and productivity and between production per man-hour and the kind and extent of the mechanized tools that a nation uses. A broad picture of the growth in annual income and in other measures of the plane of living in the United States was presented in Chap. 2.

The increase in the level of average income in the United States over the past century and the relative average incomes in different countries today can be measured roughly by the capital accumulated and invested per worker or by the horsepower of mechanical power from coal, oil, gas, and falling water that is available to each worker. Average income and wages in the United States have multiplied largely because capital per worker and mechanical power per worker have been multiplied. Real income of the American worker is roughly six times the real income of the Russian worker, measured in the staples of food and clothing, partly because the mechanical power available to the American worker is about six times as great and production is about six times as fast. Part Three of this volume, which covers the conditions for progress, will be concerned very largely with this concept of productivity—the rate of production.

A Dynamic Model. It will be convenient to explain and illustrate some of the general characteristics of a dynamic society by a simplified model for the same reasons that the model of perfect competition was used to explain the operations of exchange and production in the static state in Part Two of this book. This dynamic model will come closer to the conditions of the real world, but it will not have all the qualities and characteristics of the real world. It can include only a small segment of an actual dynamic society. It is intended to show only one combination of conditions of a dynamic society—what happens to production, employment, and to exchange when a change in the methods of production is introduced. All other conditions that are continually changing in the real world will be immobilized in this simplified model.

Imagine a model that will duplicate on a small scale and in extremely simple form the essential elements of a producing and trading community. This model consists of only two groups of workers: a group of weavers whose leader we will call Mr. Weaver and a group of shoemakers whose leader is Mr. Shoemaker. Each of these groups trades with the other or through some intermediate trading agency. Each group is both producer and consumer as in an actual community.

In order to keep the model as simple as possible, it will be assumed that Mr. Weaver has a way of using or selling (through the village general store, for example) all the shoes that he takes in exchange from Mr. Shoemaker's group, and, likewise, Mr. Shoemaker can use or otherwise dispose of all the woolen cloth he takes in exchange from Mr. Weaver. These sales will be at unchanging prices. For these laboratory experiments the prices of all goods bought and sold by these two groups will be assumed constant. The obvious needs of the workers for other goods and services are excluded from the experiment merely to simplify the conditions. This simplification, however, will not affect the consequences of the particular change of conditions we will study.

The group of weavers and the group of shoemakers are assumed to be equal partners in their respective enterprises. The leaders share equally with the others. This partnership arrangement is assumed for convenience only and to avoid the complications of the distribution of profits and wages to individual workers at this stage of our studies. This form of organization is not significant and is not an essential part of the model. The major results that will be observed would not be changed in principle if the more familiar organization of an owner and hired workers were used.

The model contains a closed or restricted market. It is a closed trading community. In this respect it is the antithesis of the model of perfect competition in which there is an open market for all producers and all goods and in which prices are determined entirely by supply and demand. In the dynamic model the market is restricted, and prices must be controlled by the producer for reasons that will appear.

Also, to avoid unnecessary complication in this elementary model, only current production and incomes will be considered. The use of past savings and the use of bank credit will not be included.

The group headed by Mr. Weaver produces 100 yards of woolen cloth every 6 days and the equal number of workmen, headed by Mr. Shoemaker, produces 50 pairs of men's shoes in the same time. Each week 100 yards of cloth are exchanged for 50 pairs of shoes. These are the conditions that exist at the beginning of the experiment. Mr. Weaver and Mr. Shoemaker are agreed that this is a fair and satisfactory exchange, and the two groups have exchanged their labor on this basis for a long time. If the prices of cloth and shoes are assumed to be fixed at $5 a yard for cloth and $10 a pair for shoes, each group earns a gross income of $500 a week. These prices and other conditions have existed so long that they are accepted as a part of the natural economic order.

Mr. Weaver's cycle of production is not completed and ready for another cycle to begin until the cloth is exchanged for shoes and the shoes have been converted into money at the established prices. Likewise, Mr. Shoemaker's production cycle is completed only when the shoes are exchanged for cloth and the cloth exchanged for dollars.

During the long procession of weeks and years that preceded our experiment, nothing ever happened to change the level of employment, incomes, and production. The number of workers in the cooperative association remained the same; the methods and tools were not changed; if the effort or skill of individual workers varied from week to week, the hours were changed accordingly. By long tradition weekly production was held to 100 yards of cloth and 50 pairs of shoes. The gross income of each group was $500, week following week. The system was static and in equilibrium.

Then one of the younger weavers of a mechanical turn of mind conceived an idea for an improvement in the hand looms whereby he believed the production of cloth could be greatly increased. After considerable discussion and argument, he convinced his fellows that the idea was practicable and worth a trial. By this decision saving and the conversion of wealth into capital was begun, and the long-established equilibrium was about to be upset. The ingenious and progressive weaver was assigned the job of making the new parts for an experimental loom. While he was so engaged, all the other weavers worked longer hours in order to turn out the same 100 yards of cloth each week.

During this period the weavers were "investing" their additional hours of labor in the hope of future gain. This investment, it will be observed, involved faith in an idea and risk that it might not be successful. In effect, the weavers, working to produce cloth, were saving the product of the weaver who was assigned the job of developing an improved loom.

The experimental loom was finally completed and the ideas for improving the loom were found to be successful. The increase in output appeared very promising. Then followed a second period and kind of conversion of wealth into capital—the production job of changing all the looms to incorporate the new improvements. During this period also production was maintained at the customary rate of 100 yards each week, and all the weavers put in extra time working to convert the old looms to the improved design. As old looms were changed over, the average production per man-hour gradually increased and more time was available for accelerating the changeover. Finally, all the looms were changed over, and the group, working again full time on weaving, found that they were able to produce 200 yards of cloth in a single week—double the old rate.[1]

It should be noted that "investment" did not curtail current production even though the weavers were "fully employed" before the investment program was undertaken. That is, the weavers were "fully employed" by any usual definition, but an ambitious man striving to get ahead is never fully employed by routine work.

Mr. Weaver now has 200 yards of cloth to trade with Mr. Shoemaker, but Mr. Shoemaker can produce only at the old rate of 50 pairs of shoes. Mr. Weaver and his men during the investment period worked longer hours to improve their equipment and increase their production. They should be able to "cash in" on their ingenuity, ability, and longer hours, but something is missing. They have no chance to exchange their increased production at the old price in the restricted market that has been assumed.

There are several courses of action that Mr. Weaver might take to overcome the difficulty:

In the first place, he could forget the investment in extra hours of work, the invention of the improved loom, and the hopes of his group for more income and better living. He could reduce the "price" of woolen cloth one-half and trade his 200 yards for 50 pairs of shoes. This is the way that perfect competition would solve the price problem. But the weavers would hardly consider this a satisfactory solution. The shoemakers who had done nothing to deserve larger incomes would secure all the benefits from the progressiveness and "investment" of the weavers—a topsy-turvy outcome indeed. Moreover, Mr. Weaver could not continue to produce 200 yards of cloth for 50 pairs of shoes because of the doubled cost of the yarn. If these out-of-pocket cash costs are assumed to be 50 per cent of the original gross sales value, or $2.50 a yard, material for 200 yards of cloth would be $500. The value of 50 pairs of shoes would also be $500. Consequently, after one trade the weavers would have nothing left for themselves. Mr. Weaver would be forced to restrict his production to more nearly the size of his market.

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[1] This result is not unreasonable; single improvements in the early hand looms more than doubled output per man-hour. A single worker using a power loom with automatic shuttle could produce more cloth than 200 men, using hand looms.

We have discovered already some of the characteristic differences between the static and dynamic models. The open markets and perfect competition of the static model offer no incentive for faster production and a higher plane of living. An industry that produces more finds itself penalized by lower prices and may even receive a lower total income for its greater production if the elasticity of demand is less than unity. A single firm trying to develop a new product would find itself in the same discouraging situation under the conditions of perfect competition.

Mr. Weaver might think of a second solution: He could "maintain his price" and exchange 100 yards of cloth for 50 pairs of shoes at the old established rate. But he would have 100 yards of cloth on his hands with no market. Obviously, he could not continue to produce 200 yards of cloth and sell only 100 yards—again, because of the out-of-pocket cash costs, if for no other reason. So, if Mr. Weaver insisted on maintaining the old price, he would be compelled to restrict production, let us assume, to the old level of 100 yards a week. But the looms now have a capacity double this rate. One-half of the looms and workers could produce the 100 yards and the other half would be idle or the whole group could work half time. He would discover "technological unemployment" and the understandable opposition of workers to the short-run effects of laborsaving machinery in a market of limited size. It also provides a clue to an explanation of the reduction in working hours that has occurred in actual industry over the years.

Obviously, restriction of production and employment would not be a desirable social solution of Mr. Weaver's problem, but it would be ridiculous in view of all the conditions to call Mr. Weaver and his group selfish and antisocial because they might refuse to work for nothing and to blame them for working for their own interest instead of for the best interests of an undeserving society (limited to the shoemakers, in this case).

Mr. Weaver can dispose of the increased output of the more productive looms at the old ratio of exchange and so provide the reward of increased income for the weavers and the increased product for the market if the shoemakers could increase their production to match the increased production achieved by the weavers. The shoemakers could either increase their production per man-hour or they could recruit more workers for their group. It will be assumed that at the moment the shoemakers are unable to increase their production per man-hour and Mr. Weaver induces Mr. Shoemaker to bring in additional shoemakers until the group can produce 100 pairs of shoes each week. This requires a working force twice the size of the original force. It must be assumed that the shoemakers had the means (in additional current labor or otherwise) to produce the additional shoemaking equipment that would be required.

Under the new conditions, 200 yards of cloth can be exchanged for 100 pairs of shoes at the old rate of 2 yards of cloth for 1 pair of shoes. Now the weavers can enjoy the higher incomes that their investment made possible. Each weaver has double his old income for the same hours of work and for the same effort. Each of the shoemakers has the same income as he had before the change, but double the number of men are employed. This new state of equilibrium is one possible end-result of the weavers' initial investment: larger incomes for themselves and more employment for others.

But there is still one feature of this new equilibrium that may not be satisfactory to the *shoemakers*. They are living in a community where other workers are receiving twice the income for no more hours or effort. It is easy to understand that the shoemakers might be dissatisfied. They might complain that the weavers are a privileged class and can exert a disproportionate influence on the exchange of goods and, consequently, on the kinds of goods that are produced. These "upper-income-bracket" workers can afford to buy more goods and more expensive goods than can the shoemakers. In short, incomes are now unequally distributed. Progress has introduced a new problem. Should the local government (in which the "underprivileged" shoemakers could outvote the wealthy weavers) "redistribute" incomes by unequal taxation? This solution might discourage more ingenious and more ambitious workers from undertaking any additional investment in the future. Progress might be discouraged. Inequality of income is inevitable in a dynamic society unless progress is to be discouraged and the economy revert to a static condition.

In our simple model the real equity of the situation is clear. Each weaver produces twice as much as each shoemaker and thereby has twice as much to exchange. The equitable solution and the best social solution is for the shoemakers also to produce more so that they will have more to exchange. The most desirable solution (which, however, is not always attainable) is for the shoemakers to discover how to double their own productivity and to invest their current time and labor in the invention and production of better equipment. If the shoemakers can double their production per man-hour in this way, as the weavers did, the shoemakers will then face the same opportunity for increased incomes as the weavers, but also they will face the same exchange problem that the weavers solved. It then will be the weavers' turn to engage more workers and to increase the size of their investment in looms and other necessary facilities or to find new ways to increase their production per man-hour. The only additional assumption that must be made is that the outside market can take the larger volume of goods. This assumption implies that progress is occurring in the outside market: that more workers in other communities are employed or production per man-hour is increased so that the necessary goods for exchange are produced. Progress started in one small group must spread in ever-widening circles if its full benefits are to be realized.

The train of events that started with the weavers' investment in better equipment resulted in more men employed and in higher total income. When both weavers and shoemakers doubled their productivity and doubled their working force, each worker earned twice the income and the enlarged community did four times the volume of business. The outside market had to expand. It will be noted that technological unemployment occurs only in the transition stage when the economy is advancing from one level of productivity to a higher level. Paradoxically, the remedy for technological unemployment is more laborsaving machinery—not less—and still higher production per man-hour. The one necessary condition is that the laborsaving machines be more widely and more uniformly distributed. The remedy for technological unemployment is more production per man-hour among more workers, not less production per man-hour or fewer workers. In actual industry there would be some intermediate temporary adjustments. The number of weavers might be reduced (as the number of coal miners in the United States has been reduced over the past generation by increased mechanization) and the displaced weavers—usually the younger and less experienced—could have found employment in the enlarged shoemaker group.

It is also interesting to observe that each of these two groups of workers was dependent on the other for its advancement. The weavers took the initiative, but could not realize on their investment until the shoemakers (or some other consuming group in the actual world) did something to make possible the exchange of the larger production. Then when the shoemakers increased their production per man, no good came out of it until the weavers were able to increase their production for exchange.

By observing the operation of this simplified model, it is possible to see and to understand some of the basic principles of production and exchange in a progressive economy that are difficult to isolate and observe in actual industry.

Supply and Demand. By far the most important discovery we have made is that the unrestrained operation of the law of supply and demand in a dynamic economy is inimical to progress.

When the weavers by improving their method of production doubled their weekly output, the law of supply and demand under the conditions of perfect competition would operate to give all the benefits of the increased production to the undeserving shoemakers. None of the benefits would go to the weavers who were responsible for the increased production. Under perfect competition the incentive for progress in production is absent. The static law of supply and demand under the conditions of perfect competition completely destroys or at best weakens the incentives that tend to increase production in a dynamic society.[2]

The Restricted Market. It follows, from the absence of incentives for progress in the perfect market of the static economy, that progress requires a controlled market in which the producer exercises some measures of control over supply and price.

The model also shows one reason why, in manufacturing industries, supply—controlled to match demand—is restricted to the quantity of goods a limited market will take. The reason is the out-of-pocket costs of production. In the general case in industry, where workers are hired at guaranteed wage rates, out-of-pocket costs include payroll costs in addition to the costs of purchased materials and services which were the only out-of-pocket costs in this weaver-shoemaker model. One of the major factors responsible for the different production policies in owner-operated farming and in manufacturing is the relative sizes of out-of-pocket production costs (as will be explained in a later chapter).

The model assumes as first a severely limited market and then a larger market by bringing in twice as many shoemakers. Many actual markets are limited markets, especially markets for goods and services that are not necessities and for all new kinds of goods and services. It will be shown in the next chapter that in actual markets restricted markets expand into more open markets, thus following the behavior of the dynamic model.

The Principle of Increasing Returns. The normal state of the static model is equilibrium, but, as we learned in preceding chapters, no position of equilibrium is possible unless marginal utilities decrease or marginal costs increase with increasing acquisition of goods in exchange or with increasing output of goods in production.

On the other hand, the normal state of the dynamic economy is change. Rates of investment are continually changing; the capital employed in industry is increasing or diminishing; incomes are increasing or diminishing; methods of production are changing. In the dynamic economy it is possible to increase the amount of capital used with a constant worker group without limit and without running into the effects of the law of diminishing returns. The reason, of course, is that the dynamic society implies continual change in the form of capital, in the kinds of equipment, and in the methods of production. The capital per worker has increased ten times during the past century in American industry. The static principle of diminishing returns is more than offset by the beneficial effects of technological advances in methods of production. The contrary principle of increasing returns through changing methods of production and greater output per man-hour is the distinguishing mark of the dyanmic society. The principle of diminishing returns is the necessary characteristic of a static society.

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[2] This simplified example and the general case are consistent in behavior. When aggregate production of a standardized commodity is increased by improved manufacturing methods (presumably at lower unit cost), the effect on the supply schedule is to shift it to the right in the demand-supply chart (as in Fig. 4 • 2). This shift results in a lower equilibrium price, assuming no change in the demand schedule. If the elasticity of demand of the product is unity or less, the producer gains no advantage because of his enterprise and investment in additional or improved equipment. When elasticity of demand is unity, the increase in output is exactly offset by an equal decrease in unit price. The producer gains some advantage when the elasticity of demand exceeds unity. Thus, the incentives that would lead the producer to increase his investment in equipment and in engineering staff are weakened or completely nullified, depending on the elasticity of demand of the specific product and market.

Many of the problems of a dynamic economy—the control of illegal monopoly and mass unemployment, to mention only two of them—are rooted in changing productivity and progress. A high-productivity economy has its own problems, but the overwhelming problem of the general poverty of a static system is not one of them.

Investment, the Source of Progress. The operations of the model show how increased production comes from investment—not necessarily investment of money in the familiar sense—but the investment of time, effort, and brains in developing improved production methods and improved equipment. Increased production in American industry has come from more investment per worker and not, in any significant way, from greater physical effort and certainly not from longer working hours. Hours have been shortened some 30 per cent over the past 40 years. The experiment shows the direct line of descent from some strong incentive toward progress to an idea; investment to give physical form and substance to the idea; and, finally, to increased production per man-hour resulting from this chain of events. The important point is that investment in this physical sense is necessary for progress. Those economists who during the Great Depression concluded that American industry had passed its peak of development under its own power, and that sufficient opportunities for investment to absorb money savings would be lacking, overlooked the insatiable appetite for savings that progress develops, an appetite that increases with the size and efficiency of production.

Technological Unemployment. Progress brings problems as well as benefits. One of the transitional effects of improved methods of production is the unemployment caused by the ability of a smaller number of workers to produce the original volume of goods. From the beginning of the factory system this temporary consequence of improved methods of production has led to shortsighted opposition to the introduction of laborsaving machines and new methods. This opposition to improved machinery reappears with every major decline in general business activity.

Technological unemployment disappears as soon as the specific market can be expanded to absorb the increased production made possible by improved methods. Then increased productivity results in increased incomes for the workers who increase their production per man-hour, and increased productivity in one group or in one industry produces more and more employment—at the same income per worker—for other groups of workers who do not increase production per worker. Or part or all of the dividend of increased productivity can be used to reduce working hours, but only for those workers who have increased their production per man-hour. The long-run cure for technological unemployment is more laborsaving machinery, not less, providing it is more widely and evenly distributed.

Inequality of Income. Then it is seen that changes in relative productivity (one group of workers being more productive than other groups) cause inequality of income. Inequality of income is frequently cited as one of the major defects of the American system of private capitalism. But here in this experiment inequality of income is found to be the result of progress and justice to the more productvie worker. With an enforced equality of income, the benefits of progress—as long as there was progress—would accrue to those who had contributed nothing to progress.

The model also indicates the remedy for the social and political disadvantages of inequality. Inequality of income between the weavers and the shoemakers disappeared when (1) the shoemakers increased their productivity to match the increase by the weavers, and (2) the market could again be enlarged. In actual progressive industry, if all are to benefit, first one group and then another group forges ahead, and there must be a continual spreading of increases in productivity and in growth of markets to take the increased production off the market. Otherwise, increase in productivity means that fewer workers can produce the old quantity of goods and some workers will be unemployed or will work shorter hours, and will receive reduced real incomes.

Equality of earning power is always desirable; equality of money income, which is purchasing power, may be good or bad, depending on its source. It is bad if it is accomplished in a way that destroys the incentives for work and progress.

Earning Power. Another lesson to be learned from this dynamic model is the close relation that exists between true earning power, measured in terms of real income and goods produced on the one hand, and production per man-hour on the other. Increased real income (earning power) originates in increased production per man-hour. There would have been no increase in the weavers' income if one of the weavers had not started, and the entire group of weavers completed, their investment in improved equipment. But the weavers realized the benefits from their investment only when the shoemakers also produced more shoes either by more men employed or by greater production per man. But the shoemakers in their turn could not increase their income per worker until they increased their production per worker.

Purchasing Power. The model shows the true distinction between earning power and purchasing power. *Earning power* produces income and income provides *purchasing power.* Earning power and purchasing power are different aspects of the same thing, but their sources are different. Earning power is the source of income; income is the source of purchasing power; purchasing power arising from production is the result of earning power. If purchasing power is emphasized and looked upon as an end in itself, as it is by so many humanitarians, there is danger that the primary role of earning power may be forgotten. Misplaced emphasis on purchasing power leads to many of the current misconceptions concerning the desirability of maintaining purchasing power, regardless of its source. Purchasing power is always good if it originates in earning power and if it comes from production; it may have undesirable repercussions if it is unearned. We cannot have too much earning power, and the more equally distributed it is, because of high, widely spread productivity, the better. The same unqualified statements cannot be made about purchasing power.

Private Enterprise Is Cooperative Enterprise. In this laboratory model we have come upon a fundamental but seldom mentioned principle of private capitalism. Private enterprise is cooperative enterprise. Many people believe that the philosophy and ethics of business are based on the practice: "Each man for himself and the devil take the hindmost"; that business is wholly a struggle for individual survival, that each man must rely solely on his own strength and live by dint of his own ruthlessness. This dog-eat-dog philosophy, however, is not the underlying principle of private capitalism nor is it the most profitable practice, even from the individual's own interest.

We have seen in this model that the weavers could progress in income only when the shoemakers benefited also, either by more employment or by greater productivity. Both groups profited most when each profited and only when the same kind of benefits spread out through wider markets. This characterisitc of private capitalism follows necessarily from the division of labor and the exchange of labor in modern industry. No one works for himself alone in the sense that he uses the things he produces. Each man exchanges his products for other products. Every worker works for some customer. And the customer as a producer works for some other customer. Each worker is dependent on the earning power of a multitude of other workers. Backward and inefficient workers limit the employment and earnings of the more productive workers (by limiting the size of their markets). Inefficient industries limit the prosperity of more efficient industries. Under-developed and backward regions limit potential employment in highly industrialized regions; poverty-stricken countries hold down the possible prosperity of wealthier nations.

Those Americans who fear increased competition from Europe or Asia in the event of greater industrialization in those continents have not learned the simple lesson taught by the weavers and shoemakers of our model community: that the most efficient producers make the best customers. Backward regions produce few customers. Our best customers in foreign trade are the most highly industrialized nations—those which produce most efficiently and abundantly. Increased earning power provides increased buying power. We help ourselves most by helping others increase their earning power.

Summary

The conditions and assumptions that determine the nature of the dynamic society can be outlined by contrasting them with the corresponding conditions and assumptions of the static state. The dynamic society is marked by continual change and uncertainty. Because of uncertainty and uninsurable risk, the possibility of pure profit is present. The possibility of profit provides one of the strongest incentives for change and for progress. Capital can be accumulated and used, cumulatively, to increase progress, profits, and capital accumulation. Because of these conditions, the gifted entrepreneur, professional manager, inventor, innovator are highly important in a progressive, dynamic society.

In the dynamic society, progress requires a restricted or controlled price market; there is a highly effective combination of competition and creative monopoly.

In the static state, the operation of the principle of diminishing returns is a necessary condition for equilibrium. In the progressive, dynamic society, the opposite-acting principle of increasing returns is a necessary factor. In the dynamic society the effects of the principle of diminishing returns can be nullified by changes in the form of capital and in methods of production.

In the static state, conditions are perfectly fluid and economic forces operate instantly to achieve equilibrium. In the dynamic state, monopolistic conditions—the control over supply and price—tend to weaken economic forces and to freeze conditions before true equilibrium is reached. But this is not the most significant difference between the static and dynamic states. The most significant difference lies in the nature of the forces in the dynamic society: the opportunities and incentives provided by uncertainty, by changes in methods of production, and for the accumulation and use of capital. The increased use of capital per worker is the most effective way in which more wealth per person can be produced, more capital accumulated and invested.

This is a cumulative process that can go on increasing the plane of living of a society without end.

These contrasting conditions of the static and dynamic societies are developed and illustrated by means of a simplified model of a dynamic society consisting of a group of weavers and a group of shoemakers. The operations of a dynamic society are brought out by assuming that the group of weavers double their production per man-hour by an improved method of weaving. This dynamic model brings out these characteristics of the dynamic society:

1. The conditions of exchange have been greatly altered. When aggregate supply is increased under perfect competition, and if an elasticity of demand of unity is assumed, the increased production will bring in no increase in income. Price is reduced in the same ratio that supply and demand are increased. Under these static conditions, there is no incentive to increase production by improved methods of production. There is no increased income to pay for the costs of developing new methods and new machines.

2. In order that the more productive workers will receive adequate reward for their larger production, producers must have some measure of control over the supply and price. The open market of the static model must be replaced by *the restricted market of the dynamic model.*

3. The important principle of diminishing returns of the static model is more than offset by the *principle of increasing returns* through improved methods of production.

4. *Investment* of time or money is necessary for progress.

5. Progress introduces problems as well as conferring benefits. With more efficient methods and tools for production, a smaller working force (or the same force working fewer hours) can satisfy the existing demand. *Technological unemployment* is a temporary result of improved production methods; but unemployment from this cause disappears as soon as the specific market can be expanded. The long-run cure for technological unemployment is more laborsaving machinery, not less.

6. Another problem accented by progress is *inequality of income.* The more highly productive groups increase their incomes above the incomes of less productive workers. The best remedy for inequality of income is more widely spread ability to produce. Equality of earning power—the ability to produce—is always desirable; equality of income, which is purchasing power, is good or bad depending on its source.

7. *Earning power* is closely associated with production per man-hour. Earning power produces income and income provides *purchasing power.* Higher earning power is always desirable. We cannot have too much earning power, and the more equally distributed it is, the better.

8. Finally, dynamic *private capitalism is cooperative* in its nature. The more productive groups, industries, and nations can realize the full benefit from their ability and industry only to the extent that other groups, industries, and nations increase their production. Progressive industry is necessarily cooperative industry.

Review Questions

1. *a.* In what way does the behavior of production per man-hour define the static society? The dynamic society?
   b. How does production per man-hour affect the plane of living (average real income) of a nation?

2. Give several illustrations from your own experience or observation of increases in the rate of production that have contributed to the increase in the American plane of living. In answering this question, consider "production" to include the complete process from production of raw materials to the delivery of goods to the user.

3. When the weavers in their dynamic society increased the production of cloth and the shoemakers did not increase their production of shoes, what would have happened to the price of shoes and of cloth under the specified conditions, providing a perfectly competitive market limited to these two products is assumed? Do you think the results should be satisfactory to the weavers? To the shoemakers?

4. In what major way does the restricted or limited market of the weaver-shoemaker model affect the operation of the static law of supply and demand, as compared with the operation of this law in a theoretical market of perfect competition in which all products exchanged are assumed to have highly elastic demand schedules?

5. Assume that the static law of supply and demand can be supplied without qualification to the following conditions:
   a. One-half the firms in an industry double their output per man-hour and total output with no change in number of workers employed or hours worked. Assume that the demand schedule does not change. What will happen to market price? Assume one-half of product cost is purchased materials and services that do not change in cost. What will happen to profit or loss of the progressive half of the industry and to the unprogressive half?
   b. What would happen to market price and to profit or loss if the nonprogressive firms adopt the same improved equipment and achieve the same results and double their output? Assume no change in the demand schedule.

6. Do you think that the price behavior under perfect competition would encourage or discourage economic progress?

7. Give at least four important differences in the behavior of production or exchange under perfect competition in a static society and under the conditions of the weaver-shoemaker model.

8. Which society would you prefer to live in: a society in which perfect competition and other features of the static state functioned perfectly or a society which had dynamic characteristics, including monopoly and other "frictions"? If you prefer the dynamic society, to what extent, if any, would you impose limits to monopoly or to other frictions?

9. *a.* Name two important socioeconomic problems that arise in a dynamic society that would not be found in a static society.
   b. In what directions should the just solution of these probems be sought?

10. Whenever there is fear of a decline in business activity and employment, public and labor leaders are likely to propose various plans with the object of preventing a decline in purchasing power. Which of the two following plans would you prefer:
    a. A major increase in public works construction projects; or
    b. An equal expenditure of government funds for direct payments to the unemployed and others in need of help.
    Give reasons for your preference.

11. How would you distinguish between *earning power* and *purchasing power?* Are increases in each equally desirable? Give reasons.

8. COMPETITION AND MONOPOLY IN ACTUAL MARKETS

As we did with the simpler conditions of the static model, it will be desirable to begin the study of dynamic industry with the investigation of the operation of exchanges—of how the law of supply and demand operates in an economy of change and disturbance. We can then tackle the more complicated problems of production.

The Nature of Actual Markets. The real world we are about to study is a dynamic world in which disturbance and uncertainty are the normal condition; a world in which changes occur so rapidly and continuously that static equilibrium is never attained; it is a world in which capital and management are the dynamic factors of progress. It is a world of new inventions, new products, new industries, and new markets; a world in which man's acquisitive spirit and dissatisfactions and the opportunities for profit are the driving forces that create more production for less labor, wth lower costs and higher real wages; in short, economic progress.

Actual markets in this dynamic world of constant change may be usefully divided into *open competitive-price markets* and *controlled-price markets. Open competitive-price markets* are those that most nearly approach the characteristics and conditions of perfect competition; where there are a large number of relatively small producers, buyers, and sellers; where it is relatively easy for new firms to enter the market and for existing firms to close up shop; where aggregate supply *cannot* be controlled effectively; and where price is established, to a considerable extent, by aggregate supply and aggregate demand.

The open markets that grew up in the larger towns in Europe in the Middle Ages, and that still exist in primitive economies, are good examples of the simple open market we are describing. Tourists are familiar with the weekly markets of Toluca and other Mexican cities. Large numbers of farmers and artisans bring their goods to the market and people from the town and surrounding countryside come to buy. Trading is free and open to all. Any producer can bring his wares to market; any buyer can enter the market on equal terms. In the Middle Ages trading in closed shops, as in modern cities, was not considered in the public interest. Attempts by large buyers to "forestall the market" by going out into the country or into the factory towns to buy up supplies of goods before they reached the open market were frowned upon. Both of these practices weakened the freedom of the open market.

Producers and traders, operating in open competitive-price markets. usually deal with staple, relatively standardized products; require relatively little capital; and are usually of small size. Profits (in the accounting sense) are usually low measured as a per cent of sales, but may be large in dollars and as a per cent of net worth (net worth being invested capital supplied by owners and by profits earned in the business).

The open competitive-price markets of modern times are no longer the free and open market place where buyers and sellers gather to trade. These simple and primitive markets could not meet the needs of large-scale mechanized production. The nearest modern approach to these open markets is the commodity exchanges and the security exchanges or stock markets. But a large segment of modern buying and selling takes place under conditions that are relatively free and open. Typical kinds of business that operate in such markets are: farming; wholesale and retail stores; service shops; low-overhead manufacturing, such as handicrafts, needle trades, and some clay and cement industries.

Recently, attention has been called to the dynamic nature of actual competition even with standardized products and in relatively open markets. The degree of competition changes with changes in the relationship of supply and demand and in other market conditions. In a seller's market in which demand overbalances supply, competition among sellers will be weak and a wide range in price can exist. In a buyer's market, in the same product and with the same buyers and sellers, competition among sellers will be intense and the price spread will be narrow or will disappear. The degree of competition is continually shifting with changes in demand and supply, and especially with changes in demand associated with the different phases of the business cycle. The concept of an equilibrium price does not fit the everchanging market conditions of a dynamic society.[1]

One of the typical characteristics of the open market is lack of control over supply (and, consequently, lack of control over market price). But in spite of this, attempts to control supply in open markets are being made continually. A number of examples, rubber, for instance, were given in Chap. 4.

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[1] This realistic concept of "dynamic competitiôn" is advanced by Raymond Rodgers and H. E. Luedicke in an article in the March, 1949, issue of *Harvard Business Review*, p. 237.

Probably the best-known example is the attempt of the U.S. Department of Agriculture, acting for producers of each major crop, to control the supply and price of staple crops, such as wheat, cotton, tobacco, and potatoes.

Continued attempts to control supply are understandable. Industries that operate in open markets can easily suffer from too much competition; *i.e.*, too much supply competing for a limited demand. The difficulties are increased when elasticity of demand is low. In farm industries excess supply usually comes from natural causes; in manufacturing industries it comes from overcrowding of producers into a particular field with price wars, subnormal wages and general business and labor instability as the result. Both competition and monopoly can be destructive to growth and decent working conditions, and require some regulation to avoid social loss.

Manufacturing industries which are not suitable for mechanization, and where much hand labor is necessary, and where small capital investment per worker is the rule are the industries that are apt to encounter excessive and ruthless competition. Entry of new firms is easy; the average firm is small; old firms are continually going under, but new firms take their place. Prices, wages, and profits are all too low.

Recent history of the women's coat and suit trade in New York City illustrates a situation of this kind: how the industry was improved and how it ran afoul of the Federal government's doctrinaire worship of unlimited competition.

Eighty-five per cent of all the women's coats and suits manufactured in the United States are made in an area within 75 miles of New York City. This industry is organized into 16 employer associations with 350 relatively large-selling agencies or jobbers who select the styles and buy the materials and subcontract manufacture to more than 1,000 small factory units, most of whom employ not more than 25 workers. Labor is organized in David Dubinsky's International Ladies' Garment Workers Union, representing about 50,000 workers all over the United States.

Before 1933 the dog-eat-dog competition within this industry produced sweatshops, low wages, long hours, and a high rate of mortality among business firms, all in spite of strong unionization.

Then the government's National Recovery Administration was set up in 1933, and the cloak and suit industry accepted it as an opportunity to introduce some degree of regulation of wages and working conditions within the industry, and to place competition on a less ruthless basis; in short, to control in some degree supply and price.

Under the NRA code, all of these objectives were attained, and conditions in the industry greatly improved. When the Supreme Court killed NRA, the employer associations and the Union formed a voluntary "code authority"—the National Coat and Suit Industry Recovery Board—which has continued the work begun by the NRA Code Authority.

Because the Recovery Board exercised some control over prices, the Federal Trade Commission charged the Board with monopoly practices "in restraint of trade," and specifically with coercing manufacturers into membership and into buying and using labels.

The best defense of the Board is the benefits it has brought to both labor and employers. Bankruptcies have decreased, better wages and working conditions have been secured for labor, and a code of fair practice has been established among producers.

Not all industries can increase their productivity and their wages by increased mechanization. These inherently low-productivity industries require different remedies for "restraint of trade" than do highly mechanized, high-productivity industries. A decent wage scale can be maintained and a high mortality rate among business firms can be avoided only by some measure of regulation of competitive practices and by maintaining a floor under wages. Their normal tendency is too much competition, not too much monopoly.

The inherent opportunities for the use of capital and mechanization in different industries greatly influence competitive conditions. Industries that require little capital investment inevitably face extreme competition. These industries and their workers need protection against ruthless, unethical competition. In these industries there is no need to fear too much monopoly. On the other hand, industries that require large investment per worker are protected inherently by that condition against a multitude of competitors. In these industries the danger to guard against is too little competition.

Controlled-price markets are those in which supply and price can be controlled easily because of the natural conditions under which production and exchange take place. Producers that operate in controlled markets range from pure monopolists through oligopoly and all degrees and kinds of combined monopoly and competition.[2]

Industries that do business in controlled-price markets are generally those that require large capital investment and large expenditures prior to production. These conditions also result in large fixed or overhead costs. These industries include most public utilities such as electric power, water, gas, communication, and transportation, where capital investment is large and where duplication of investment by competing companies would be socially undesirable. They also include most of the so-called heavy manufacturing industries and mass-production industries in the

[2] By definition, pure monopoly exists when there is only one supplier of a product in a given market. Oligopoly exists when there is only a small number of large suppliers in a given market.

durable-goods field such as steel, automobile, electrical equipment, farm machinery, and industrial machinery industries. In these industries (because of heavy investment and the economics of large-scale production), a small number of large corporations usually dominate each industry.

There is a large number of big and little firms and corporations that operate in a controlled-price market because they are operating in industries where new products are being created and where existing products are developing rapidly. These are the new, rapidly growing industries where change is the ruling order.

New products start with negligible demand, and worth-while commercial demand must be created. Markets for new products seldom exist until they are created by the expenditure of time, labor, and money. It is plain that production (supply) must be limited to very small quantities at first and increased only as rapidly as demand can be created. In fact, it is difficult to imagine how a new product or a new industry could be developed under the conditions imposed by the free competition of the open market.

A socially valuable characteristic of the controlled-price market is its recognition of product development costs as a necessary cost of production and as a factor in determining market price. The recovery of development costs incurred in advance of commercial production in the market price would be impossible under the conditions of perfect competition, and, as a matter of fact, cannot be recovered to any considerable extent under the conditions of the open market of actual industry. In this connection it is interesting to observe that in the case of farm products, the open-market conditions under which they are sold have made it impossible for the private farm industry to pay for more than a minor part of its own applied research. The U.S. Department of Agriculture and the state universities have done most of the job with public funds. On the other hand, the manufacturing industries that operate in controlled markets have been able to finance this applied research and development job as a part of their production costs and to recover these costs in their market prices. The controlled market contributes to economic progress and to increased employment to the extent that it makes possible new business ventures and new products by strengthening incentives and by reducing the financial risks connected with new ventures.

Management Policy Concerning Output and Employment. We found in our study of the operations of the single firm in a static economy that monopoly restricts output and employment only under conditions that are seldom encountered in actual industry—that is, when average unit costs are increasing at high-volume output and when price policy is such that prices are deliberately reduced to increase volume of sales.

We can now pursue this question further with greater emphasis on management policy.

In the typical mechanized industry, and especially when management is aggressively improving methods of production and the design of product, fixed costs are relatively large and the opportunity for profit is greatest at capacity output. Therefore, managements of the great majority of manufacturing enterprises strive for maximum profit *and* maximum output. These two goals are consistent and not at all antagonistic in the typical firm, but also, both goals are conditioned by over-all market demand. Even if cost and revenue relations were such as to result in maximum profit at an output below capacity, there are strong reasons why management would still place maximum output ahead of maximum short-term profit. Management could not afford to restrict production or refuse orders in order to maximize short-term profit. Such a restrictive policy would result in loss of competitive position that would reduce profits seriously over the longer term.

Each firm in a growing competitive industry is continually striving to maintain or improve its historical position in its markets. A firm cannot stand still without actually falling behind. "Competitive position" is measured by the per cent of the total available business the firm is able to obtain. For example, over the 20 years prior to the Second World War, Ford dropped from first position to third position in the passenger automobile industry and General Motors moved up from second to first place. Under the special postwar conditions of 1947 the smaller auto manufacturers considerably improved their competitive position. Each manufacturer watches the ratio his sales bear to the total market. He cannot afford to fall behind in this race for position. And it is easiest to improve his position at times of maximum demand when buyers are hunting for goods. Manufacturers have learned that position lost because of lack of capacity or poor performance in boom times is very hard to make up during the following decline in demand, when every competitor has idle capacity and every producer is desperately hunting for customers. Market position is held or improved by fighting for position all of the time.

No management can afford to sacrifice its position in its industry by deliberately reducing output in order to earn a larger short-term profit (on the assumption that a larger output *would* result in smaller total profit). But as has been shown, the entire question is academic because few managements are faced by this problem of seriously increasing costs at large outputs.

Manufacturers' Price Policy. For the products of mechanized manufacturing the cost of production is the most important factor in determining prices. Low prices are desirable because materially lower prices increase the size of potential markets in the over-all competition of different products for a larger share of the national income, but prices in the long run are necessarily determined by average costs of production. Costs of production (as we learned in Chap. 5) are influenced greatly by volume of production because of the effects of fixed costs, and manufacturers have to base their costs on some *normal volume* of output with "normal" based on past history or on expectations. From that anchor point management can study the possibilities of price reductions or the necessity for price increases and guess at the effect of such price changes on volume of sales.

Experience soon teaches the adventurous price reducer that his competitors can play the same game. The price reducer must be sure of his costs and figure that his price cut is justified and that he can maintain it even if he fails to increase his relative competitive position at the lower price level.

The manufacturer who operates in a relatively open market, and the manufacturer who operates in a controlled-price market, both *plan their operations* on the assumption that they are operating in a market with a fixed-price structure over the short term (such as a season or "model year," or for longer periods in producers' goods industries). A manufacturer of women's dresses, for example, might plan for 1946 the production of dresses in a definite price class—say, dresses that retail for $37.50. This same manufacturer might plan in 1947 to produce a completely different line of dresses to retail at $19.95 of lower quality and lower "markup" because of a change in general market demand. In neither case would he plan to change his price during the season. He might be compelled to change it drastically near the end of the season to move unsold stock, but this change in price would be the result of some miscalculation or failure to guess market demand or style. It would not represent a deliberate price policy to adjust his volume of production to some point of maximum profit.

The manufacturer of producers' goods (capital goods) usually operates in a controlled-price market in which prices are much more stable than in the soft-goods consumer markets. He can plan his operations for a fixed price structure over a period that may last for several years.

Management is usually buying raw materials at fixed prices and is buying labor at fixed wage rates—both over the short term. Market prices of materials and wage rates cannot be changed significantly even by the largest producers.

Management is also selling at fixed prices at a given time and in a given market. For these reasons management plans its operations and calculates standard costs on the basis of constant wage rates, material costs, and market prices.

The important inference that should be drawn from these facts and conditions is that the manufacturer does not think in terms of a flexible price structure and of adjusting prices at frequent intervals according to some demand schedule in order to operate at some selected output. *The manufacturer's short-term planning is done on the basis of a constant unit price no matter in what field of competition he may operate.* Over the longer term management will work for lower unit *costs* in order that lower prices can be set or in order to absorb higher prices for labor or raw material at the same market price for the product.

The theory of monopolistic competition places emphasis on the adjustment of output in order to maximize profit. In practice, the manager places most emphasis on cost reduction to increase profit at the maximum possible output he can achieve.

The objectives of wise managements—and the record shows how well these objectives of American management have been achieved—is to increase production of goods and jobs and to increase wages and prices by reducing over-all costs of production through increasing production per man-hour.

The low-cost producer in an industry is usually its price leader and he is able to set the price level of his industry. The character and business morals of any industry are determined, to a considerable degree, by the character and business morals of the leading producers of that industry. The price leader may decide to adopt a low-price policy (or he may decide otherwise!) for one or more of the following reasons:

1. He may reduce prices because he believes in the long-term advantage of a low-price policy and because, in general, he believes lower prices will broaden his markets. (How much, he does not know.)
2. He may reduce prices in the hope that his competitors will not be able to follow his lead (usually a vain hope), or, if they do, that they will be weakened financially because of reduced profits or actual losses.
3. Experience has shown him that wage increases have absorbed the largest part of past cost reductions. He may reduce prices when justified by cost reductions as an alternate to increases in wage and salary scales. Price reductions are to be preferred because they are beneficial usually to more people.
4. He may reduce prices (whenever his costs permit) in order to keep himself and his competitors "on their toes" and to make it more difficult for less skillful firms to enter his market. Holding up prices unreasonably above costs he calls "holding a price umbrella" over his actual or potential competitors.

There is no automatic mechanism in actual industry that leads to some specific level of production at an output that corresponds with maximum profit such as we developed under the assumptions of perfect or monopolistic competition when the goal is maximum profit and costs are still declining at capacity output. There is no "condition of equilibrium" in a progressive industry and there will be none so long as methods of production are being improved. "Stability is not established automatically by natural law, but is the finest fruit of economic statesmanship."[3]

Nothing that has been said should be taken to mean that all managers or corporation managements think alike or follow the same policy regarding prices. It is generally true that the most successful managements and the healthiest industries do follow a low-price policy, *but with costs of production as the basic independent variable.* For the leader in an industry price reductions follow cost reductions. For companies that are compelled to follow the leader, price reductions may precede cost reductions if the followers expect to maintain their competitive position. It is also true that general *price increases* follow *cost increases* that are sufficiently widespread to affect all competitors more or less alike. Such upward readjustment of prices to costs occurred during 1946 and through 1948. It is also true that American industry historically has followed a low-cost, high-productivity, high-wage, and low-price policy.

Prices are not so "flexible" as many economists recommend for the simple reason that the typical manufacturing industry has appreciable fixed costs and because price is seldom the most important factor in determining the quantity demanded. Price competition is frequently the recourse of the lazy or ineffective operator. The firm that uses price competition as its main resource is generally the firm that cannot compete successfully on reputation, on quality, or on service. Another and broader reason for a fixed-price policy is the small margin—of the typical manufacturer—between unit, out-of-pocket cost and market price.

Many concerns could not exist if the strongest and lowest cost firm in the industry attempted to reach its "maximum profit" output and "hog the market," by reducing prices until the output of maximum profit was attained. Under some conditions this ruthless policy would bankrupt the entire industry. Ruthless aggression by the strongest firm in an industry would be just as destructive to all sound values as would ruthless aggression by the strongest nation in international relations.[4]

Managements of manufacturing firms are concerned primarily with two objectives in the area of output and profits:

1. To produce products at the lowest possible costs;
2. To secure an increasing share of the available business at all times within the boundaries of ethical practice.

At times of minimum demand, the producer needs an increased share of the going business to reduce losses. Few durable-goods producers can avoid losses at outputs less than 50 per cent of capacity. At times of maximum demand also the producer is taking all the business he can handle in order to maintain or to improve his position in his industry.

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[3] DRUCKER, PETER, "Concept of the Corporation," The John Day Company, New York, 1946.

[4] See also the discussion of this subject in Chap. 5, starting with p. 99.

Supply and Demand in Actual Markets. The operation of the law of supply and demand in actual markets, and the important differences in this behavior as compared with its operation under conditions of perfect competition, can be studied by the analysis of an example taken from industry.

In the fall of 1937 there occurred one of those general declines in business conditions that we know as the depression phase of the business cycle. We will study business cycles in considerable detail toward the end of this book, but at the moment we are interested in only one aspect of depression: the general decline in the demand for all kinds of goods and services. The nature and size of this particular decline of 1937–1938 can be seen in some of the statistics of Chap. 2. It can be illustrated more vividly by the experience of a typical large corporation in the automotive industry. In the third quarter of 1937 before the effects of depression began to be felt, this manufacturer was selling cars at an annual rate of 1 million cars. By June, 1938, sales had dropped to an annual rate of only 372,000 cars.

This extreme drop—or, in fact, any drop—in production and sales need not have happened under the theoretical conditions of perfect competition. The total production of 1 million cars—or even larger production—could have been sold at a price determined by the law of supply and demand. In the static model it is very simple. Price alone clears the market at any level of production.

Industry management sometimes is criticized because prices are not reduced sufficiently in times of depression to maintain demand and thereby maintain employment and purchasing power at the full-employment prosperity level. Why does management choose to reduce production and employment instead of following the lowered-price policy indicated by the static theory? We came across the basic reason in the dynamic model when the weavers doubled their production and did not wish to cut the price of cloth in half so that the market would take their full production. We can observe the same principles at work in real life by following the experience of this typical manufacturer during the depression of 1937–1938.[5]

Under the direction of Dr. C. F. Roos, an industry-wide study was made to determine the behavior of the actual demand for passenger cars and to calculate, if possible, a statistical demand schedule for passenger cars from actual sales and prices. The latter objective could be reached only approximately and not very conclusively because of the many conditions other than price that determine demand in actual markets (which were discussed in Chap. 4, pages 66–75), and especially because of the difficulties associated with differences in quality and specifications of different makes and models of cars.

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[5] The facts for this example are taken from two papers presented at a joint meeting of the American Statistical Association and The Econometric Society in Detroit, Dec. 27, 1938. The theoretical paper was written by C. F. Roos and Victor von Szeliski of the Institute of Applied Econometrics, New York City, and an application paper was presented by S. M. Dubrul.

The authors concluded that the statistical price elasticity for automobiles is in the neighborhood of 1.5 when the average price of the three popular low-priced cars is used as the average market price; but any value from unity to two could be justified just as well. Elasticity of unity means that a 1 per cent reduction in price would result in a 1 per cent increase in sales, all other factors remaining the same.

But, notwithstanding the difficulty of determining an accurate value of price elasticity, the study provides an excellent view of the operation of the principle of supply and demand for a manufactured product in actual markets.

When the demand schedule and price elasticity are known, it is possible to calculate the price that will produce a given volume of sales (as explained in Chap. 4). It is then possible to determine the more practical production aspects of the price reduction that would be necessary if the prosperity level of production and employment is to be maintained.

The conclusion that this particular study reached is that even with a price elasticity of two (which is most favorable to the contention that full production can be maintained by sufficient price reduction), all of the major automobile manufacturers would have had to reduce prices appreciably below the out-of-pocket costs of production in order to maintain demand at the early 1937 level.

In the third quarter of 1937, it is assumed that low-priced passenger cars were selling at an annual rate of 1 million units at an average factory price of $637 per car. In October, 1937, new 1938 models began to sell at an average price of $704, an increase of about 10 per cent. If price alone determined demand, and with price elasticity of two, 800,000 cars would have been sold at the increased price (as shown by Fig. 8 • 1).

Experience in selling automobile shows there is no clear indication of actual demand for the new models until after the model change-over period. It was not until November that this company could estimate its annual demand for the 1937–1938 season. Actual demand then appeared to be only 653,000 cars instead of the 800,000 cars indicated by the statistical demand schedule. Obviously, "other conditions" affecting actual demand had changed. With this point on a new demand schedule established (653,000 cars demanded at the average price of $704), it is possible to draw a second schedule through this point and with the same price elasticity of two (marked

"Nov. '37" on the chart). The demand schedule obviously had shifted sharply to the left from the third quarter of 1937 to November, 1937.

Demand continued to decline—because of the same factors that caused the depression in general business—until June, 1938, when at the average price of $704, annual demand had fallen to only 372,000 cars. A third demand schedule can be drawn through this point (372,000 cars demanded at the average price of $704) and with the price elasticity of two. This third demand schedule is marked "June, 1938" in Fig. 8 • 1.

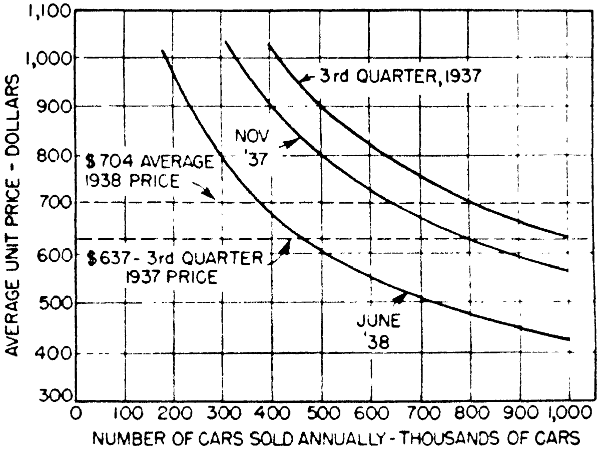

Fig. 8 • 1. Demand Schedules for Automobiles—Elasticity of Two

These are three statistical demand schedules for automobiles showing the downward shift in general demand during a business depression. The shift in demand from the third quarter of 1937 to June, 1938, resulted in a reduction in the number of automobiles demanded (at the 1937 price) from 1 million cars to less than 400,000 cars. To maintain the 1937 demand for 1 million cars in June, 1938, would have required a reduction in price to $430.

In the third quarter of 1937, it will be remembered, cars were selling at the annual rate of 1 million cars. To have maintained this sales volume with the lower demand schedule that existed in June, 1938, would have required a price of $430, according to the chart.

The average factory cost of the 1938 model at an annual volume of 1 million cars was $600, and all of this except $6 per car for depreciation allowance is actual out-of-pocket cost. If the manufacturer could have guessed 8 months in advance what the June, 1938, demand schedule would be, and if the price had been set at $430 to maintain sales and production at 1 million cars, the manufacturer would have incurred cash losses (not including depreciation allowances) of $164 million at an annual rate. Even the largest and wealthiest corporation could not face a loss of this magnitude without encountering a serious financial problem.

There is one more uncertainty that the manufacturer would have to face: The figures cited are based on the favorable price elasticity of two. As this study showed, it is impossible to determine the statistical demand schedule within a wide range. If the demand schedule were unity instead of two, as it might be, the necessary average price per car would be $260, and the out-of-pocket cash loss would be the staggering sum of $334 million.

This example emphasizes the serious problem that must be faced by a manufacturer who attempts to apply the simple law of supply and demand to the conditions of actual markets and actual production. Demand schedules cannot be determined with any accuracy in actual markets, and are continually shifting with general business conditions. In the second place, the law of supply and demand does not recognize the existence of costs of production, but the manufacturer who might attempt to maintain his volume of sales by a flexible-price policy—as called for by the assumptions and conditions of perfect competition—regardless of his costs, would be bankrupt in the first general business decline. The static law of supply and demand obviously does not provide a practical answer to general business depression and mass unemployment. We will come to more adequate answers when we study the causes of business fluctuations.

Case Histories of New Products. A few very brief case histories of the introduction and development of new manufactured products and new materials are presented at this point to illustrate some of the principles of controlled-price markets that have been presented. This short list could be extended almost indefinitely because technological change is one of the most obvious characteristics of American industry.

Magnesium. Magnesium metal was first produced in the United States by the Dow Chemical Company of Midland, Mich., in 1918, after imports from Germany were cut off by the First World War. By 1920, after numerous technical difficulties, 20,000 pounds were produced. An annual market demand for 6.5 million pounds at about 20 cents a pound was developed by 1939, but in only 4 years of the 22 between 1918 and 1940 could the Dow Company earn a profit in spite of its monopoly. Over this period the market price was voluntarily reduced from $1.83 a pound to 20.4 cents a pound to increase the quantity of the metal the market could absorb. Then came the sudden demand created by the successful use of magnesium metal in aircraft by the Germans and by the production requirements during the Second World War. Production of magnesium at the peak of war demand increased nearly ten times to 63 million pounds.

With the return to peacetime industry, the problem reverted to its familiar pattern of the creation and development of market demand—the development of new commercial uses for this valuable but difficult light metal.

Home-radio Receiving Sets. During the First World War the radiotelephone was developed into a practical instrument by the development and application of new radio tubes and circuits. At the end of the war some military receiving sets were made available to civilians, and the public immediately took to this new form of entertainment and communication. Amateur radiotelegraph operators and others began to play with this new scientific toy. Soon boys all over the country were building radio receiving sets from cardboard oatmeal boxes, with a "crystal" and a "cat's whisker" as the detector.

The larger electrical manufacturing companies were ready to produce commercial receiving sets with crystal or tube detectors, but they could not invest the necessary capital for facilities and development unless a broader market could be created.

Then Harry P. Davis, vice-president, and Frank Conrad, assistant chief engineer of Westinghouse, conceived the idea of public broadcast programs. The first commercial broadcasting station was established at the East Pittsburgh works of the company, and KDKA was born.

A new mass market developed almost overnight and a new industry began its amazing career. At first there were only three companies—Westinghouse, General Electric, and American Telephone—equipped to enter this new field. Patents covering a complete system were owned among these three companies, and during the initial years these three companies controlled the growing industry.

Prices of receiving sets and of radio tubes were established independently and competitively by the two producers—Westinghouse and General Electric. Initial prices were high judged by later prices. These high prices were necessary because production costs were high; research and development were extensive; designs were changed frequently as the art rapidly developed, and also because the manufacturing companies found it advisable to assist in the establishment of broadcast stations—a part of the necessary cost of creating a new mass market.

In 1922 the 100,000 receiving sets that were sold in the new industry had an average retail price of $50. Within 20 years, in 1941, 13 million sets were sold by more than 50 manufacturers at a total market value of nearly 500 million dollars. The retail price of the average set was about $38. During the earlier years sets had grown larger and more complicated until in 1929 the average set had a retail price of $133. During the depression the small table-size sets were introduced, which, together with other factors, reduced the average price to $38, as noted.

When this new industry was created, the market was a controlled-price market based on a strong patent situation. Prices were established to cover high initial development and production costs. As the new industry progressed in size and maturity, production costs were reduced; many new producers came into the market; prices for sets of better performance and quality were reduced. The market gradually changed from a small, high-cost, high-per cent-profit specialty market into a large, low-cost, low-per cent-profit staple market. The market changed from a typical controlled-price market to a typical open market. Neither of the two large corporations that started manufacturing in this new industry in the early 1920's was among the largest producers in the market in 1941.

During 20 years, from 1922 to 1941, 900 different brand names of radio receiving sets appeared on the market. In 1939, 166 brand names remained. In 1941 there were 82 manufacturers of complete radio receivers and 7 manufacturers of radio-set tubes. There were over 700 manufacturers of radio-set parts. These figures indicate how completely the home-radio market had changed from a controlled-price market into an open market.

Electric Refrigerators. The electric refrigerator industry started on a small scale after years of laboratory and experimental development with only two major producers. In 1921, 5,000 refrigerators were sold at an average retail price of $550. In 1941, with over 30 manufacturers in the field, 3.5 million refrigerators were marketed at an average retail price of $155. Out of 74 different brand names that appeared in the market over the years, only 33 remained in February, 1940.

Electric Washing Machines. This appliance was introduced relatively early among household electric appliances, but developed more slowly than some. In 1909, 3,000 washers were sold at an average proce of $75. With a market for larger and better machines, 800,000 washers were sold in 1926 at an average price of $147. In 1941, nearly 2 million machines were sold at an average price of $78.

Controlled Markets Develop into Open Markets. These thumbnail sketches of the introduction of a few of the innumerable new products of American industry illustrate one of the significant characteristics of American markets: that controlled markets, in which monopoly characteristics are strongest, tend to develop into open markets in which competitive elements predominate. In a progressive, dynamic economy new products are constantly introduced under conditions of monopoly, but as these new products are developed and mass markets are created for them, the product changes from a specialty with one or a few producers into a staple product with many producers. The market changes from a controlled-price market into an open, competitive-price market.

Progressively, basic patents expire, design changes become less radical, designs and types become more stabilized; the industry gradually changes from an engineering industry into a commercial industry. The extent and severity of the competition that develops in a particular case depends on the amount of capital and technical skill required to enter the new, expanding industry, and on the relative advantages of large-scale production. With home-radio receiving sets, new producers can buy parts and set up an assembly plant, for which little capital is required. Hundreds of new producers entered the industry as soon as a nation-wide market had been created. The custom-molding of small plastic products is another business that requires little skill and practically no capital because presses can be rented; it is a new rapidly growing industry in which there are hundreds of firms and where competition is intense. Metal stamping is another example. On the other hand, electrical refrigerators require considerable capital, know-how, and a national distribution organization to enter the business. Automobiles furnish a still more difficult and expensive breaking-in problem.

As soon as any new product shows signs of creating a market of large size, new producers attempt to enter the industry. These new companies need to incur relatively small initial development costs and they are inclined to depend on price competition to offset the reputation and market acceptance of the original producers. The growing American practice licensing all producers who apply for rights under the patents of the new product tends to accelerate the development of an open market and to shorten the period during which the original producer can recover his development costs.

It is important to note the nature and mode of growth in a progressive, dynamic economy. New products are introduced, and new industries and new demand are created under the favorable conditions of a price-controlled market. It is improbable that new products could be developed and new markets created except under these favorable conditions. New consumer products and industries, if they become commercially successful, develop open, highly competitive price markets. The trend in an expanding economy, therefore, is from monopoly-controlled price markets toward more competitive and broader open, competitive-price markets, at least in the production and marketing of these consumers' goods. This analysis and these examples of consumer products provide no support for the popular opinion that the trend in American industry is toward more and more monopoly.

It is in the public interest that the size of the market and the number of producers of new products be increased, but it is even more important in the interests of economic progress that the creative development of new products and markets be sufficiently encouraged.

There is a relatively small number of individuals and organizations among large and small companies that have the ability, resourcefulness, and resources to create new products and new markets. Good management, initiative, and skill are scarce factors. For every one of these originators there are a dozen imitators who are ready to rush into any promising market. The successful imitators also serve a useful social function and must possess alertness and manufacturing and commercial ability of a high order. They constitute a different kind of organization, however, from the creative engineering organization that can start a new major product and industry on a successful career.

As long as these competitive forces of the American market continue to operate, there is little danger that the creators of new things and new markets will be able to collect an exorbitant price from society for their services. The greater danger is that society will be niggardly, and will be willing to pay these rare innovators too little for their ability, for the important services they perform, and for the risks and development costs they incur.

The essential role of the United States Patent System is to provide protection of this kind to inventors and to business firms which undertake the commercial development of new materials, products, and markets.

There Is Good Monopoly and Bad Monopoly. The economist defines monopoly as control over supply and control over price by a single producer. The monopolistic supplier, however, cannot control demand, which considerably limits his power to control actual markets. The consumer is the final authority in actual markets except in times of abnormal scarcities.

The examples of new product developments that have just been described point up the social values of the monopoly characteristics that exist in all actual markets. Without the financial protection, or, more accurately, the reduction of financial risk that the controlled-price market provides, technological progress in industry would be seriously reduced.

The existence of some good in monopoly, however, does not mean that all monopoly is good or that monopoly power is always wisely used. All kinds of power, however necessary they may be, can be abused. It is necessary, then, to distinguish between two aspects of monopoly or two kinds of monopoly. There is, first, the good kind of monopoly that results in the creation of new products, new industries, and new markets, which has just been described. Then there is the socially bad type of monopoly that aims to hold down production—as, for example, the control of the world's diamond output.

In the first, or creative type of monopoly, there is only the necessary restriction of output to control supply to match existing or anticipated demand. In this socially good monopoly, producers strive to create the greatest possible demand by reducing costs and prices and by all other ways open to them. These monopolists are public benefactors; they create new industries; discover new sources of raw materials; develop new uses for natural resources that were formerly useless; create new sources of employment and outlets for investment.

The other and truly restrictive monopoly performs none of these useful services. Here there is no desire to create demand without limit. On the contrary, there is deliberate action to limit demand by maintaining a high price level that is not justified by production cost. An artificial scarcity is the goal of this policy of market restriction.

Fortunately, there are few examples of this restrictive kind of monopoly in its extreme form. The diamond monopoly is unique. Artificial scarcity can be maintained successfully only when supported by natural scarcity.

These two kinds of monopoly can be differentiated by the policy that governs the creation of demand: if the policy is one of expansion of demand by all practicable means, the monopoly is creative and good; if the policy is one of deliberate restriction of demand, the monopoly is restrictive and bad. Policy concerning demand is the distinguishing mark of good or bad monopoly. The more common definition of monopoly as "control over supply" should be supplemented by a definition based on the attempt to limit demand.

Attempts to restrict production of some farm products (as described in a previous chapter) to match a demand that is highly inelastic, are neither creative nor restrictive with reference to demand. In the case of many staple agricultural products, demand neither can be created nor restricted. The farmer can attempt to control his production to match a demand largely beyond his power to influence. This kind of monopolistic restriction is no worse from a social viewpoint than the temporary restriction of the supply of manufactured products to match the maximum demand that can be created at the moment.

It is necessary, however, to distinguish carefully between the deliberate, unnecessary restriction that is the mark of bad monopoly and the restriction of production to balance output against demand that is necessary for solvency. Restriction that merits condemnation is the deliberate, intentional policy of maintaining an artificial scarcity by prices that have no logical relation to costs of production; a policy that aims to increase profits through high prices instead of low costs.

The United States Patent System. The United States Patent System is an outstanding example of good monopoly that is generally recognized as socially and economically justified. The patent system is closely related to technological change and economic progress in the United States through the development of new ideas and new markets, and is generally given a large share of credit for the outstanding progress of American industry.

A United States patent confers limited monopoly rights on the owner for 17 years. For this period the owner has the sole right to use and develop the invention covered by the patent and has the opportunity, through this right and the associated right to control the price of products embodying the invention (subject to certain qualifications), to recover the cost of developing the invention and the cost of placing new products on the market and creating a demand for them.

During the past 10 to 15 years there has been a growing opinion that the United States Patent System should be changed to limit the monopoly rights of the owners of patents; to require the owner to license any other producer who may wish to use the patent; to more completely limit the right of the owner to control the price of products that use the patent. This trend is undoubtedly one of the practical results of the widespread popular opinion that all monopoly rights are injurious to society because they "restrict production and employment." This opinion has little basis in the operations of actual industry, and its application to the patent policy of the United States can have harmful effects by limiting invention and the patenting of new ideas. If an invention cannot be protected for a reasonable term of years, individual inventors will be unable to sell their ideas to others who may be in a position to develop the invention, and it will be more difficult to recover the costs of commercial development. There will be less invention and less progress.

There is a strong connection between inventive activity and economic progress. A policy on the part of Congress or the courts that discourages invention will surely slow down economic progress. The rise and fall of patent applications has followed closely the rise and fall of prospects for profit. There can be too little protection of creative monopoly. A wise policy should aim to provide enough protection of patent rights to encourage invention and aid investment, but not to provide so much protection that the owners of patents can keep other investors out of the field for too long a time. Admittedly, this is not an easy policy to formulate or apply, but there would be more progress and less argument if this basic principle were more generally recognized.

Illegal Monopoly. It is also necessary to distinguish between legal monopoly and illegal monopoly. It might seem that all good monopoly should be legal and all bad monopoly should be illegal, but it is not so simple. Legality and illegality depend on national legislation and on court interpretations of the law. In the United States, collusive actions or policies by competitors are illegal restraints of trade, although the same actions in other countries may be legalized and encouraged. In the Soviet Union, and more recently in Great Britain, national ownership of whole industries has converted them into legal monopolies of the state.

The United States Patent System, although generally recognized as a strong force for economic progress, has been used as a cloak for various forms of unethical or illegal monopoly practices. Patents have been bought primarily to eliminate effective competition; agreements to license the use of patents have been used to establish and maintain market prices and sales quotas or to eliminate foreign competition. As with all kinds of power, monopoly power can be used beneficially and in the best interests of society, or it can be abused. It is a proper purpose of the antimonopoly laws to prevent the misuse of monopoly power; it should not be the purpose of the antimonopoly laws to destroy the beneficial effects of monopoly on progress.

The policy of the U.S. government for many years has been directed to the encouragement of effective competition and the prevention of illegal monopoly—the misuse of monopoly power. Illegal monopoly is defined very broadly in the antitrust laws as "unreasonable restraint of trade." The laws and the courts attempt to prevent collusive action to limit competition or to establish prices or sales quotas. Until recently the owners of patents exercised control over prices and quotas through patent-license agreements, but this practice has been declared illegal by recent court decisions.

The government agencies charged with the administration of the antitrust laws have found it a difficult task to establish the line dividing illegal monopoly from legal monopoly. When several steel companies, for example, increase pig-iron prices singly and separately, their action is legal; if the same steel companies get together and agree to increase pig-iron prices by the same amount, the concerted action is collusive and illegal.

One of the major popular arguments against the evils of monopoly confuses bigness with monopoly. Justice Louis Brandeis of the Supreme Court wrote a book on the subject that he called "The Curse of Bigness," and in which he took the position that size can become an industrial and social menace. Many of the charges brought by the Department of Justice under the Sherman and Clayton Acts are based on this concept of bigness as an evil and thus bear on the consolidation of several corporations into a single corporation, or the acquisition of smaller corporations by larger corporations.

This aspect of illegal monopoly is illustrated by a case recently decided by the Supreme Court in which the Department of Justice charged that the proposed acquisition by United States Steel Corporation of the Consolidated Steel Corporation of Los Angeles was unreasonable restraint of trade and was evidence of a "purpose to monopolize."[6]

The decision of the majority of the Court was against the government's contentions, and it is worth quoting, in part, because it illustrates the admittedly difficult problem of differentiating legal monopoly from illegal monopoly. Justice Reed, who wrote the majority opinion stated:

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[6] *United States v. Columbia Steel Company* (a subsidiary of U.S. Steel), *Consolidated Steel Corporation, United States Steel Corporation, and United States Steel Corporation of Delaware,* Supreme Court, June 7, 1948.

> To show specific intent [to monopolize] the Government recites the long history of acquisitions of United States Steel, and argues that the present acquisition when viewed in the light of that history demonstrates the specific intent to monopolize. Although this Court held in 1920 that United States Steel had not violated Section 2 [the attempt to monopolize] through the acquisition of 180 formerly independent companies, we may look to those acquisitions, as well as to the eight acquisitions from 1924 to 1943, to determine the intent of United States Steel in acquiring Consolidated. . . . The reasons given by Consolidated and United States Steel for the purchase and sale of the assets here involved seem not to involve any action condemned by the Sherman Act. Granting that the sale will to some extent affect competition, the acquisition of a firm outlet to absorb a portion of Geneva's rolled steel production seems to reflect a normal business purpose rather than a scheme to circumvent the law.

In another part of the opinion Justice Reed wrote:

> The same tests which measure the legality of vertical integration by acquisition are also applicable to the acquisition of competitors in identical or similar lines of merchandise.
>
> In determining what constitutes unreasonable restraint, we do not think the dollar volume [bigness] is in itself of compelling significance; we look rather to the percentage of business controlled; the strength of the remaining competition; whether the action springs from business requirements or 'purpose to monopolize'; the probable development of the industry, consumer demands and other characteristics of the market.

Despite the difficulty of drawing a sharp line, it is immensely important to maintain the distinction between legal and illegal monopoly, and to prevent the development of monopolies where they are restrictive and destructive to economic progress. In the long run, illegal monopoly that attempts to establish sales quotas and to stabilize prices and profits, usually hurts the industry that makes the attempt.

There is nothing so stimulating to progress in established industries as competition—that ever-present possibility that some competitor will be more aggressive in developing improved products, in giving better service, and in reducing costs than one's own company and by these methods improve its competitive position. And, likewise, there is nothing so deadening to a company or an industry as protection against this kind of creative competition. In the long run, the protected industry becomes less progressive, less efficient. Protection from healthful competition is an open invitation to laziness, and the restrictive monopolist is usually his own worst enemy.

One aspect of government administration of antimonopoly laws that may be questioned is the usual recognition of price as the sole mark of effective competition. This is unfortunate because in progressive industry quality and performance of the product and the service and fair dealing of the seller are frequently more important competitive factors than price. There is a ruling price for most commodities that competitors must meet or balance against other competitive conditions.

As has been pointed out several times, industries with decreasing-cost characteristics cannot maintain a financially strong, socially responsible industry if price is the only basis of competition and if price competition is carried ruthlessly to a logical conclusion. Pure monopoly, represented by the single surviving firm, would be the result, as has been explained.

The government attitude that price policy is the sole measure of competition undoubtedly is rooted in the theoretical analysis based on the static model of perfect competition which recognizes price reduction as the only way by which output can be increased. It will be remembered that perfect competition exists only where there is a ruling market price that all producers and sellers accept. Despite that, the contrary position, that a ruling market price for manufactured goods is evidence of the *absence* of effective competition, is commonly held. Collusion for the purpose of price fixing is clear evidence of illegal monopoly, but the existence of a ruling market price, by itself, is not indicative of collusion. The real difficulty is that factors of competition other than price are not recognized.

Is American Business Becoming More Monopolistic? It is quite generally assumed by the public that American industry is growing more and more monopolistic in the bad sense. The investigation of this interesting question was one of the major purposes of the Temporary National Economic Committee which was appointed by President Roosevelt in May, 1939. The Committee concluded that restrictive monopoly was increasing in American business, and based its conclusion on the increased concentration of control of American industry in a small number of large corporations; and on the apparent trend toward financial self-sufficiency of large corporations. The need for greatly increased working capital and fixed-capital assets since the end of the Second World War demonstrated that some of the largest and strongest American corporations were not as self-sufficient as their leaders then believed.

Bigness and similar measures of monopoly concern the structure of industry and not its performance. A more fruitful test would seem to be some measure of the way in which American industry operates and the conditions that have come out of its operations. What kind of record is American industry producing?

There are three such measures that can be used. Bad monopoly is believed by the public to restrict production and output, to increase prices, and to increase profits. If American industry has been growing more monopolistic in this bad sense since the turn of the century, one might expect that these monopolistic trends in production, prices, and profits would begin to show up. The record, however, shows just the opposite trends. The outstanding trends in American industry over the past 50 years, and over the past 20 years as well, have been the considerable expansion in output and employment in manufacturing industry; the stationary level of prices (except for the two great price inflations caused by war and money inflation), and the decline in corporation profits when measured against the capital employed. On all three counts the performance of American industry is exactly the opposite of that which the critics—who charge American industry with restrictive monopoly—would predict.

If monopolists automatically, inevitably, and arbitrarily charge maximum prices; if they charge "all the traffic will bear," without regard for the cost of production, the results should be evident in the statistical record. Again the history of the prices of manufactured goods fails to support popular opinion. The average price level follows consistently the course indicated by the economic factors that apply, as will be shown later on. Prices of manufactured goods are not set arbitrarily and without relation to the costs of production. They follow closely the cost factors of raw-material prices and of unit labor cost and the effective demand based on available income. Prices are determined by the economic forces involved; they do not follow the whims of powerful monopolists.

It is also a matter of statistical record that prices of manufactured goods increase less—and fall less—than the prices of farm products and foods during periods of inflation and depression. Farm products and foods are handled in open markets where prices are clearly the result of world economic forces. Yet the prices of manufactured products—supposed to be set by unpredictable monopolists—fluctuate much less violently, not because of the virtues or of the sins of monopolists, but in accordance with underlying economic forces at work. Over the longer term, real prices of manufactured goods have declined, while the price trend of farm products has been upward.

Modern mechanized industry is necessarily monopolistic in structure; the number of producers in many industries is small; entry of new firms into an established industry is difficult; producers do exercise complete control over supply and they appear to have the power to set prices to suit their own interests. Superficially, industry appears to grow more monopolistic in the public mind because American industry grows and the largest corporations grow with it.

These characteristics, however, are not the important ones. The most important factors are the actual production, employment, and price policies of American businessmen. These have been discussed at length in the preceding pages. Actual policies can be restrictive, short sighted, and foolish, or they can favor expansion and progress. The amazing expansion of American industry effectively refutes the charge of a long-term trend toward restrictive monopoly.

Summary

Actual markets may be divided into open-price markets that most nearly approach the characteristics and conditions of perfect competition, and controlled-price markets in which both supply and price are under some measure of control by producers.

Typical kinds of business firms that operate in open-price markets are farmers, wholesale and retail stores, and manufacturers in industries with low overhead, little mechanization, and much hand work. In open-price markets, producers have little or no control over supply and over market price.

Typical kinds of business firms that operate in controlled-price markets are the public utilities and the so-called heavy manufacturing industries that require large capital investment. Among these are steel, the automobile industry, electrical machinery, farm machinery, and heavy machine tools. Also, there are many relatively small firms that operate in controlled-price markets that produce highly engineered and patented specialties and develop new products. In actual markets in a progressive economy there is no equilibrium output at which profits are a maximum. With aggressive, able mangements, the principle of increasing returns (due to improved methods of production) greatly overbalances the effects of the principle of diminishing returns. Consequently, maximum profit exists with maximum possible output, and the typical management strives to reach the largest possible output under all conditions of market demand.

The typical price policy in American markets is the maintenance of a single fixed price. This is the usual policy in manufacturing industries that operate in open-price markets and controlled-price markets. Managements of manufacturing firms are concerned with two objectives in the area of output and profits: to produce products at the lowest possible costs; and to secure an increasing share of the available business at all times.

The operation of the law of supply and demand in actual markets, and the reason why manufacturers cannot maintain demand and employment by lowering prices to the equilibrium value, is illustrated by a case study of the experience of a typical automobile manufacturer during the depression of 1937–1938.

The demand schedule for passenger cars shifted from 1 million cars demanded annually at a factory price of $637 (or 800,000 cars at $704) in the third quarter of 1937, down to 372,000 cars demanded at a price of $704 in June, 1938.

The statistical elasticity of demand was found to be between unity and two. Using an elasticity of two and the demand schedule of June, 1938, the price would have to be reduced to $430 to create a demand of 1 million cars. Since out-of-pocket production cost (total factory cost less depreciation) was $594 per car (at an output of 1 million cars), the annual loss at this price would be $164 million. Even the largest manufacturer could not have faced a loss of this size without trouble. If elasticity of demand were unity, the loss would be $334 million, if price were reduced sufficiently to maintain sales, production, and employment at 1 million cars.

This case history shows why even the strongest manufacturing corporations cannot follow a price policy in which price is reduced to maintain full output and employment.

The commercial histories of new raw materials and products point to a significant behavior of markets: controlled markets tend to develop into more open markets. Products that are initially introduced as patented specialties, like the radio and the electric refrigerator, gradually develop into standardized products with many producers and wide markets.

Monopoly is defined as control of supply and price by a single producer. The monopolist, however, cannot control demand. The customer in American markets usually holds the effective voting power and usually is in a position to make or break the single firm.

Contrary to popular opinion, there is good monopoly as well as bad monopoly. We could not have progress without some monopoly. Producers could not introduce and develop new products unless they possessed control over supply and price.

With the good kind of monopoly there is restriction of output only to the extent necessary to keep supply in step with demand at an established price governed by the costs of development and production.

With the bad kind of monopoly there is deliberate action to limit demand by maintaining a high price level that is not justified by costs. An artificial scarcity is the objective.

The United States patent system is an outstanding example of the recognition of the social value of good monopoly.

There is also legal and illegal monopoly. United States laws prohibit acts or policies that are unreasonable restraints of trade.

There is a widespread opinion that United States industry has grown more and more monopolistic, in the bad, restrictive meaning of monopoly, over the past 50 years. This opinion is based largely on the growth in size and relative importance of large corporations. Judged by the amazing expansion of American industry, and the behavior of wage rates, prices, and profits, there is little reason to believe that restrictive monopoly is crippling American industry.

Review Questions

1. Contrast the important characteristics of open markets and controlled-price markets as they are found in actual industry today.

2. A recent economics textbook comments on free or perfect competition as follows:
"A cynic might say of free competition what Bernard Shaw once said of Christianity: the only trouble with it is that it has never been tried. There never was a golden age of free competition and actual competition is not now perfect in the economists' sense; probably it is becoming less so every day."[7]
   a. Do you believe that we would experience an economic "golden age" if we did have free or perfect competition in actual markets?
   b. Do you believe, as the above quotation implies, that controlled-price markets as they exist in American industry are injurious to the economy? Give reasons.

3. Does the typical manufacturer of producer's goods follow a fixed-price policy (over the short term) or does he adjust his prices up or down according to changes in his demand schedules in order to hold his production and sales at some selected volume that he considers most desirable?

4. What factors are considered important by the typical price leader of an industry in a controlled price market in establishing market prices?

5. A recent book[8] recommends that free and open public markets be established and strengthened for farm products and industrial commodities such as pig iron, steel, cement, copper, and crude oil. The author is not so positive concerning open markets for manufactured products such as machine tools, automobiles, and houses, but he would go as far in that direction as possible. These markets, like the free markets of the Middle Ages, would be designed to establish as completely as possible prices based on unrestrained competition among large numbers of buyers and sellers. There should be neither government price supports nor price ceilings. Private sales contracts and other forms of "forestalling" should be prevented. All sales should be in the open market with complete price publicity as in modern security exchanges. This market organization would involve a major warehousing and inventory problem to equalize production against seasonal and cyclical fluctuations of sales. The successful establishment of such markets will require, in the author's opinion, the dissolution of existing monopolistic mergers and combinations; each factory or mill must be an independent seller.
   a. Do you believe this kind of freely competitive market system would be socially and economically preferable to the existing American marketing system? Specifically, would the freely competitive system lead to more or less market-price fluctuation; to more or less profit or more or less loss in the operation of the economic system; to more or less technological progress; to stability of employment or production volume?

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[7] SAMUELSON, PAUL A., "Economics: An Introductory Analysis," p. 36, McGraw-Hill Book Company, Inc., New York, 1948.

[8] MUND, VERNON A., Professor of Economics, University of Washington, "Open Markets," Harper & Brothers, New York, 1948.

b. Why do you think this author was less certain about the possibility of applying his market plan to manufactured goods?

6. An automobile company anticipates a downward shift in demand for its cars because of a decline in general business. This company is producing and selling cars at the rate of 18,000 cars per month at an average retail price (f.o.b. factory and before tax) of $1,600. Its costs are $8 million fixed costs per month and $900 variable cost per car over the range of volume used in this problem. Assume further that the actual automobile demand schedule under the original conditions is known and defined by the formula.

Price = $2,140 − 0.03 (number of cars sold per month)

and that sales will vary with price as under conditions of perfect competition:

a. The decline in demand forecast by management is defined by the equation:

Price = $2,050 − 0.03 (number of cars sold per month)

If you were general manager of this automobile company, would you reduce the average price sufficiently to maintain sales and employment at the original 18,000 volume level?

b. If you decided to reduce price to maintain output at 18,000 cars per month, what would happen to your profit or loss situation if the decline in demand proved to be much more severe than forecast and you discovered that sales (despite the lower price) were running at the rate of only 10,000 cars per month?

c. What is the equation of the actual depression demand schedule, assuming that it has the same general characteristics as the original prosperity demand schedule?

d. Would you again reduce prices to restore production to the original level of 18,000 cars per month?

e. What stated conditions of this problem would management find unrealistic and what factors would be found uncertain and difficult to estimate?

7. On the basis of your answers to the preceding question, do you believe the business practice of maintaining constant prices without regard to general demand is justified in the case of consumer durable products such as automobiles, or do you believe these prices should be reduced when the demand schedule for such goods shifts downward as it does in times of depression?

8. *a.* Explain how the development costs of new products, new materials, new production methods and processes could be paid for if markets operated under conditions of perfect competition?

b. How are these development costs recovered under the conditions of actual markets?

c. What market-pricing conditions are favorable to this kind of technological progress?

9. Do you consider that unrestrained competition in American markets is a desirable social and economic goal or would you advocate some measure of monopoly; *i.e.,*

some measure of individual producer control over supply and price of commodities? Give your reasons.

10. *a.* If you favor some degree of monopoly in American markets, how would you distinguish between desirable monopoly and undesirable monopoly?
    b. Do you believe the United States patent system confers undesirable monopoly rights on the owners of patents? What is the social justification of this form of monopoly? Do you believe patent rights should continue for 5 years, 17 years, 50 years?
    c. What are some of the economic and social evils of bad monopoly?

11. The Third Annual Report to the President of the United States of the Council of Economic Advisers (December, 1948) stated (page 16):

    "As late as when the Sherman Act was passed (1890), the normal structure of competitive business contained many firms each controlling a small part of the total market.... But we now find many industries dominated by a few large corporations. The process of concentration has proceeded so rapidly that even before the war it was reported to the Temporary National Economic Committee that four or fewer firms controlled 75 per cent or more of the production of the industries which together produced one-third—by value—of all industrial products."

    a. Do you believe the above statement gives a correct picture of the relative degree of monopoly and competition in American industry in 1890 and in 1948?
    b. Is the condition of oligarchy as reported to the TNEC a good measure of the degree of harmful monopoly in American industry?
    c. What kind of statistical evidence of the long-term effects of harmful monopoly would you look for?

12. The practical problems of establishing competition for new products is illustrated by the history of cellophane. Du Pont developed and introduced this new product in 1924 at a price of $2.65 a pound. For some years du Pont was the only producer. In recent years there have been two producers, but in 1946 du Pont still produced 75 per cent of the total. Price was rapidly reduced until it reached 33 cents a pound. Since the war price has been increased to 45 cents a pound. In 1947 the Department of Justice filed suit charging du Pont with monopolizing the cellophane industry "through patents and fixing of arbitrary non-competitive prices." Apparently prices were made too low to suit the Department. Because of this charge of monopoly, du Pont tried to secure competition by offering to any corporation desiring to enter the industry patent licenses, engineering help, and a new plant at cost instead of expanding its own production further. Du Pont officials are reported as saying: "The du Pont Company does not feel that it is in the interest of stockholders, in view of the Department of Justice's attack on the company's position in the cellophane field, to risk the very substantial sum required for the indicated needed increase." However, there were—up to Jan. 14, 1949—no takers. Capital investment of at least 20 million would be required to enter the industry (*Wall Street Journal*, Jan. 14, 1949).

    a. How does this example of monopoly match the usual ideas about the behavior of monopolists?

b. Do you believe monopoly of this kind has hurt the economy or helped the economy?

c. If you agree with the Department of Justice that this kind of monopoly is harmful, what action would you recommend to destroy it?

13. In another Department of Justice action against monopoly (which was sustained by the courts), the glass container industry, represented by its trade association, by a patent-holding and development company (the Hartford-Empire Company), and by several major producing companies, was charged with illegal monopoly. In this industry patents were used to restrict the number, geographical location, and production quotas of new firms that desired to enter the industry. A number of small firms were put out of business and volume of production of operating firms was strictly controlled by patent licenses.

a. Do you consider that in this industry the monopoly rights conferred by the patent system were misused?

b. Do you believe that this patent monopoly was injurious to society? Give reasons.

9. COSTS AND REVENUE IN MANUFACTURING AND FARMING

In Chap. 5 we explored relationships that exist among unit price (revenue), average unit cost, and marginal unit cost in a manufacturing firm under the conditions of equilibrium in a static economy. We will now extend this study to cost and revenue relationships under actual industry conditions and for both manufacturing and farming activities.

The objective of management in any business enterprise is to maximize profit. We have already discovered some of the policies concerning prices and output that this objective leads managements to adopt. We will have an opportunity in this chapter to see how manufacturing enterprises follow one output policy and farming enterprises pursue a completely different policy in actual industry. Farmers follow a general policy of full use of production resources under all conditions of general business, but, as we have learned, managers of manufacturing plants match production with actual or anticipated customer demand and cut down production and employment when general demand declines. The reasons for these contrary policies will be developed in this chapter.

Accounting Profit. In this chapter and the following chapter on the behavior of profit in manufacturing enterprises, we are dealing with profit as profit is understood by the businessman and the accountant. The economist is properly interested in separating compensation to owner managers for their services and as inducement to undertake business risks from pure profit. The economist's concept of pure profit was discussed in Chap. 5.[1] But businessmen and accountants are interested in profit as a measure of what is left for the owners of the enterprise after all out-of-pocket expenditures and accounting charges are subtracted from total revenues from the sale of products. Profit to these practical men means the owner's share from the current operations of the business and includes return from the owner's land and capital as well as pure profit.

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[1] See pp. 86–88.

The Importance of Fixed Costs in Manufacturing. The nature of fixed costs and variable costs in manufacturing was briefly described in Chap. 5. We will continue this discussion to show the effects of different ratios of fixed costs to variable costs under actual conditions.

The extensive and accelerated mechanization of factory industry that began with the Industrial Revolution has greatly increased the use of capital in manufacturing; the increased size and specialization of factory operations and the associated activities of accounting, engineering, labor relations, advertising, and other staff activities have had a still larger effect on the relative size of overhead or fixed costs.

Fixed costs are incurred without regard to the size of the output over the short term; they are necessary in about the same amount whether current output is low or whether it is straining the physical capacity of the plant. The effect of fixed costs on units costs, therefore, is to greatly inflate unit costs at small outputs and to rapidly reduce unit costs as output is increased. Large overhead costs, which are typical of large-scale mechanized manufacturing, greatly increase the pressure on management to maximize output (in order to maximize profit); and also greatly increase the difficulty of retrenchment and expense reduction when general business declines.[2]

It was the obvious effects of fixed costs on total costs and on profits in steam railroad transportation that first brought this subject to the attention of economists. The interest charges for the large capital investment for right of way and the large operating expenses necessary for maintaining the right of way were costs that quite obviously were incurred even when there was no traffic and no revenue. Any revenue that additional freight business would bring in—over and above the out-of-pocket operating costs—would help offset the burden originating in these fixed costs. Additional kinds of business were sought by the railroads by making low rates for the movement of bulk raw materials and other goods not previously handled. In effect, the large fixed costs were allocated to different classes of freight and passenger business, according to the necessities of the rate structure by what the traffic would support and to secure the largest volume of transportation business. Different rates for different "classifications" of freight were justified by the increased volume of business they made possible and by the reduction of costs of all classifications brought about by the increased volume of business.

[2] The quantitative effects of different fixed costs on unit costs are illustrated by Table 5•1, p. 92 of Chap. 5.

Other industries with large fixed costs have found it desirable to fix lower prices for bulk sales than justified by a proportionate share of fixed costs. Electric utilities, for example, establish low rates for cooking and water heating, and "off-peak" service in general in order to increase total revenue from load that does not require additional fixed charges.

The existence of high fixed costs in manufacturing introduces considerable complication into the theoretical concept of value based on cost of production. In farming and handicraft industry, most of the cost of production is represented by the worker's own labor. The village shoemaker spent as much time (and cost) on one pair of shoes, whether he worked at odd times, or whether he worked continuously. His overhead costs were small and were not apparent. Therefore, output in a given time was not an important factor in his unit cost. In factory production these simple cost relations do not hold. It is a highly important factor in costs whether the factory is employed continuously at full output, or whether it works intermittently at low total output. Overhead costs run on whether the factory is producing at a high rate or a low rate. Consequently, under modern production methods there is no longer one price that can be based on one cost of production. There are many different costs of production, a different one for each total output. It is not possible to say, without some qualifying statement, that cost of production in actual industry determines price and that cost of production to the marginal producer (who may be forced to produce at low volume) governs value. In practice, it is necessary for the manager of a plant to define cost of production by associating it with some output—usually average or "normal" output. "Standard costs" are costs at the normal output, more or less arbitrarily determined by management. It is a matter of business judgment or policy whether standard costs are based on a pessimistic low volume or on an optimistic high volume; the level of accounting costs used by management frequently depends on management judgment as to the size of "normal" output.

In manufacturing cost accounting it is the usual practice to distribute overhead costs uniformly over all labor performed in a given factory department or "cost center," but competitive conditions frequently require discrimination among products in the distribution of overhead expense, as previously referred to in railroad cost accounting. Overhead costs are frequently allocated to such products or parts of a business as will stand a heavy burden of overhead costs, while other products or services are charged whatever they can pay under existing competitive-market conditions, regardless of their equal share of overhead costs. These practices are justified if they increase over-all volume and so reduce average unit costs. Familiar examples of this justified discrimination, in addition to freight rates, are the lower night rates charged for telegrams and the lower off-peak rates for electric power.

Fixed Costs. The economist is interested in production costs and profit, principally to establish their relation to volume of output and employment. This relationship can be developed logically if production costs are divided into two categories: first, those costs that are relatively fixed by capital investment and staff operations and that are constant for some period such as a year, regardless of the volume of production during the period; and, second, those costs such as labor, expended directly on current production, and the cost of raw materials and parts that are used in current production. These two categories of costs are called fixed costs and variable costs.

Firms and industries can be classified usefully into high fixed-cost firms or industries or low fixed-cost firms or industries. The trend in modern manufacturing with its increasing use of capital per worker and with its more complex engineering, manufacturing, commercial, legal, labor-management relations and accounting staffs, is toward higher fixed costs.

Fixed costs may be defined more explicitly as those costs that are: (1) fixed by capital investment such as depreciation, maintenance of property, insurance, and local and state taxes; (2) production costs connected with research, development of new product designs, and new processes not chargeable to current commercial production; and (3) the salaries and other costs of management: supervisors, technical, commercial, legal, accounting, and other staff employees, whose mark is not directly affected by volume of current commercial production. Large scale manufacture and distribution of goods in nation-wide markets necessitate large fixed costs relative to variable costs at full production. The usual cost-accounting classification of accounts does not separate fixed costs from variable costs in this fashion; many of the cost elements directly applied to current production contain both fixed costs and variable costs.

Table 9·1 shows the composition and relative size of these various kinds of fixed costs in an actual case of a heavy machinery manufacturer and for two different periods separated by the disturbing effects of the Second World War. Contrary to the usual opinion, the fixed costs related to salaries and other staff operations are much larger, relatively, than the fixed costs associated with the costs of capital equipment.

The total fixed costs of January, 1947, were 221 per cent of the fixed costs of June, 1941. Total production capacity of the corporation measured in current dollar values increased in about the same ratio. The relatively small part of the total fixed costs that are associated with fixed-property assets is apparent. Depreciation, maintenance, insurance, and taxes amounted to only 16.3 per cent of total fixed costs in June, 1941, and to 16.1 per cent in

January, 1947. Investment in new buildings, machinery, and equipment is not so important a burden on costs during slack times as is the investment in overhead payrolls for technical and supervisory staffs.

Fixed costs are fixed only for some specific period such as a calendar year or other budget period. Fixed costs increase from year to year with the growth of a firm or with changes in its policies concerning staff activities. Many established firms found their fixed costs increased very considerably by increases in facilities and by changes in character of operations that occurred during the war period 1938–1945. Fixed costs increased as much as 100 per cent, but capacity to produce increased correspondingly, a situation illustrated by Table 9 • 1.

Table 9 • 1. Percentage Distribution of Fixed Costs in a Heavy Industry Corporation

Elements of fixed costs	June, 1941, per cent	January, 1947, per cent
Total salaries and payroll taxes of fixed costs	72.8	72.4
Advertising (excluding salaries)	4.7	4.3
Research and standard product development (excluding salaries)	6.2	7.2
Building, machinery, and equipment depreciation	4.2	6.9
Property insurance and taxes	2.5	2.3
Building, machinery, and equipment maintenance	9.6	6.9
Total fixed costs	100 0	100.0

Variable Costs. Variable costs are those that vary proportionately with output like wages for workers on direct production and for raw materials and parts going into the product. In factory operations variable costs (and expenses) are authorized by production orders or schedules. The amount of these direct production expenditures depends entirely on the volume of production orders.

In the analysis of costs, variable costs are usually treated as varying exactly in proportion with output. In practice, fixed costs are not unvarying with output nor do variable costs change exactly in step with output. But for practical purposes these simplifications do not make enough difference to affect management decisions. In practical cost analysis, then, fixed costs are assumed to be fixed (for the specific period under consideration) and variable costs are asumed to vary proportionately with output.[3]

Cost and Revenue Relationships. Figure 9 • 1 shows how total costs and total revenue vary with output. The data refer to the same lamp factory

[3] For additional discussion of the behavior of fixed and variable costs see. p. 89 of Chap. 5.

that was used in Chap. 5. Total costs are the same as the total costs of Fig. 5 • 1. Fixed costs amount to $300,000 per month and variable costs are equal to 4 cents per lamp produced. At two-shift capacity output of 18.2 million lamps per month, total variable costs are $728,000. Fixed costs amount to approximately 40 per cent of variable costs at this output.

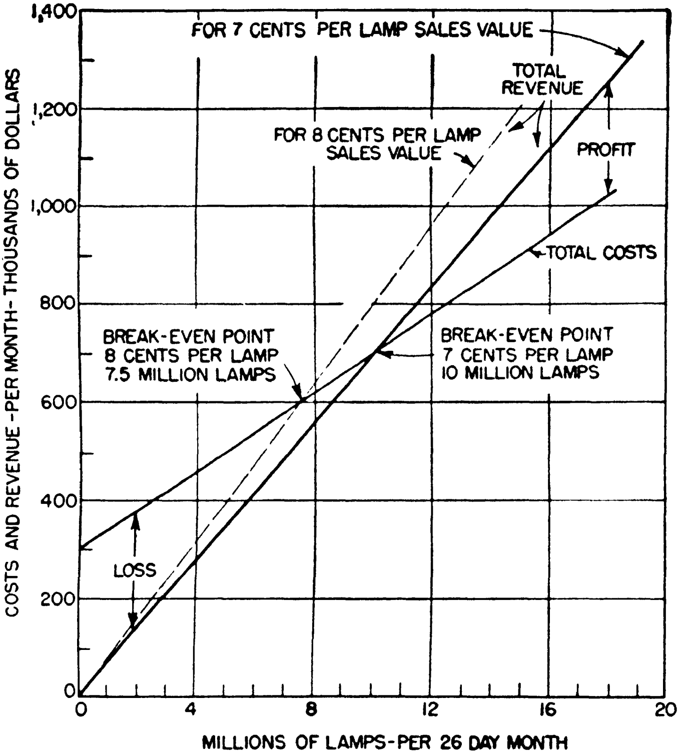

Fig. 9 • 1. Cost and Revenue Chart of a Lamp Factory

This chart shows the break-even point or output with two different total revenue conditions. The break-even point is where the cost line crosses the revenue line. The break-even point is lowered by an increase in the market price and total revenue, and would be lowered by a decrease in total costs.

The total revenue line in Fig. 9 • 1 is determined by the average factory selling price per lamp. Revenue lines are shown for selling prices of 7 cents per lamp and for 8 cents per lamp.

At 7 cents per lamp, Fig. 9 • 1 shows that up to an output of 10 million lamps per month, this factory would operate at a loss. Above 10 million lamp output, the factory would operate at a rapidly increasing profit. The output of 10 million lamps, at which loss changes to profit, is known as the *break-even point.*

At 8 cents per lamp, the revenue line shifts to the left and intersects the cost line at the lower output of 7.5 million lamps. The break-even point can be lowered by an increase in selling price or by a decrease in costs.

If, for example, variable costs per lamp could be reduced to 3.5 cents (instead of 4 cents) and selling price remained at 7 cents, the break-even point would be 8.57 million lamps.[4]

Also, the break-even point can be lowered by a reduction in fixed costs. With zero fixed costs, and assuming exact proportionality of variable cost, there would be no output at which loss would be incurred, providing unit selling price exceeded unit variable cost. Actually, there would be some loss at very low volume because neither are fixed costs zero nor are variable costs exactly proportional to output, especially at very low outputs.

The break-even point of 10 million lamps is 55 per cent of two-shift capacity output. At this factory selling price of 7 cents, the factory will operate at a loss at any output under half capacity. This fact illustrates the pressure that plant managers are under to keep output at high volume.

Highly mechanized factories such as this lamp factory have break-even points that range from 40 per cent to 60 per cent of capacity output under normal relationships of costs and prices. When costs increase in advance of, or faster than, market prices, the break-even point increases. Under the conditions of 1947–1948, some steel producers who before the war had break-even points of around 50 per cent of capacity found that their break-even points had increased to 70 or 75 per cent of capacity before selling prices were increased. When demand is in excess of capacity, as happened with steel during these postwar years, dollar profits may be large in dollars but the steel producer nevertheless may be in a highly vulnerable profit position. A drop in customer demand to 70 or 75 per cent of capacity, which is an output that is exceeded infrequently and for only a few months at a time under more normal demand conditions, would cause profits to completely disappear when the break-even point is 70–75 per cent.

When output can be measured only in units of dollars (instead of physical units of numbers of lamps or tons of steel), the representation of cost and revenue relationships poses a new problem in chart making. It is only in a factory that produces a single product that total output can be measured in physical units as in Fig. 9·1. Figure 9·2 shows the same

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[4] At break-even output, total revenue equals total cost.

Therefore

$$0.07N = \$300{,}000 + 0.035N$$

where N = number of lamps produced

$$N = \frac{\$300{,}000}{0.07 - 0.035} = 8.57 \text{ million}$$

information and relationships of the lamp factory in terms of total dollar revenue and costs.

Total revenue in Fig. 9•2 is a single line for all unit prices because the vertical scale of revenue and the horizontal scale of output are both expressed in dollars. With the same vertical and horizontal scales, the revenue line is a line inclined 45 degrees at all unit prices. A larger unit selling price does not change the location of the revenue line on the chart, but it does move the cost line to the right. The cost line in this case varies with each unit price because the same dollar cost is plotted against different total revenue.

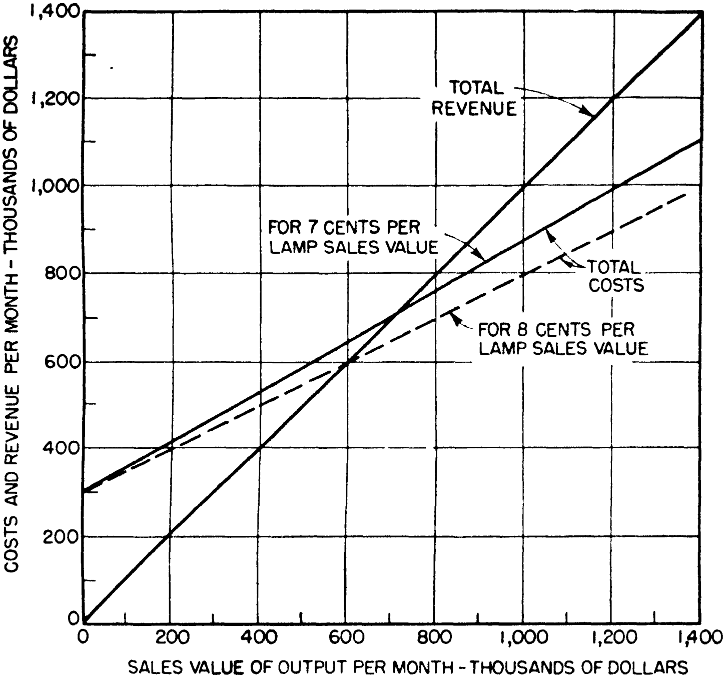

Fig. 9 • 2. Cost and Revenue Chart of a Lamp Factory—Output Measured in Dollars
When total cost and total revenue are plotted against total revenue (all in dollars), a change in market price and total revenue does not change the location of the total-revenue line, but an increase in market price does lower the plotted position of the total-cost line. This chart shows the same break-even points as Fig. 9 • 1 except that this chart shows them in dollars and Fig. 9 • 1 in numbers of lamps.

With a unit price of 7 cents, the break-even point, shown by Fig. 9•2, is at the output of $700,000. This, it will be noted, is the same output as the 10 million lamps shown by Fig. 9•1. With a unit price of 8 cents, the cost line moves to the position shown by the dotted line in Fig. 9•2 and the break-even point is lowered to $600,000 (equivalent to the 7.5 million lamps shown by Fig. 9 • 1).

As has been said, manufacturing industries may be classified into low fixed-cost industries and high fixed-cost industries. An industry with a low ratio of fixed cost to total cost is one that requires low capital investment per worker and relatively little research, engineering, and manufacturing development costs or commercial development costs. It is manufacturing industries of low fixed costs that operate in relatively open, uncontrolled-price markets. The small investment and small staff make it easy for new firms to enter the industry or for existing firms to quit. Competition is keen and may become destructive; profit rates are usually low and conditions in the industry are unstable. Industries that are adapted to handwork fall in this class; the needlework industries under conditions that existed before 1930 are a pertinent example.

High fixed-cost industries are so usually because of large capital investment in total and per worker and large and costly overhead staffs. It is consequently difficult for new firms to enter the market or for existing firms to leave the market except by consolidation or sale. There are, as a result, only a small number of large units in each industry; prices are under control of the producers, and markets approach the controlled-price type. Typical examples are steel and automobile production.

Cost and Revenue Relationships of Farm Operations. Manufacturers are frequently blamed for restricting production and employment in order to maximize profits; farmers, on the other hand, are quite generally praised for following a policy of full production in good times and bad times without regard to profit. Actually, there is occasion for neither praise nor blame. The manufacturer and the farmer are both striving for maximum profit, and their different policies and practices are the result of the different cost relationships under which they operate.

The cost and revenue relationships that exist in farm operations can be illustrated by statistics of corn production in the United States, compiled by the U.S. Department of Agriculture. Pertinent figures for a number of years since 1926 are given in Table 9 • 2.

Total production cost has been segregated into fixed cost and variable cost. Different definitions of fixed cost and variable cost are necessary to suit the conditions of farm operations. Included in fixed costs are all costs that are independent of the yield per acre and vary only with the number of acres. Fixed costs are the same only for the single crop year. Fixed costs include: costs, including all labor, of preparing the soil and planting, cultivating, fertilizer and manure, seed, rent, and miscellaneous expenses, including depreciation.

Included in variable costs are those costs that depend on yield per acre and on the total volume of the harvest. Variable costs include the costs of harvesting and marketing, less the value of by-products from the crop.

It will be noted that fixed costs of this staple crop are a large part of total costs, ranging from 78 per cent to 92 per cent.

Table 9·2. Cost and Revenue Relationships—Corn Production*

	1926	1929	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1944
Fixed costs per acre	$19.40	19.22	11.47	11.50	16.49	14.92	17.62	$16.14	15.24	15.74	16.10	17.09	20.12	26.36
Per cent of net cost per acre	84	85	88	88	92	88	92	85	84	84	84	81	78	79
Variable costs per acre	$3.70	3.49	1.61	1.53	1.40	2.09	1.57	$2.91	2.82	3.09	3.12	3.98	5.77	7.21
Net cost per acre	$23.10	22.71	13.08	13.03	17.89	17.01	19.19	$19.05	18.06	18.83	19.22	21.07	25.89	33.57
Net cost per bushel	$0.70	0.73	0.49	0.57	0.95	0.70	1.02	$0.66	0.65	0.63	0.67	0.68	0.73	1.01
Average yield per acre	25.9	26.7	26.8	22.9	15.8	24.0	16.2	28.1	27.7	29.2	28.4	31.0	35.2	33.0
Total production, million bushels	2,575	2,516	2,930	2,398	1,449	2,299	1,506	2,643	2,549	2,581	2,462	2,676	3,132	3,203
Total production cost, million dollars	$1,802	1,837	1,436	1,367	1,377	1,610	1,536	$1,744	1,657	1,626	1,650	1,820	2,286	3,235
Market price, average for season	$0.745	0.799	0.316	0.52	0.815	0.655	1.044	$0.518	0.486	0.568	0.618	0.751	0.917	1.09
Total market value at farm, million dollars	$1,919	2,010	927	1,246	1,181	1,506	1,571	$1,368	1,240	1,465	1,522	2,008	2,871	3,478
Market value per acre	$19.30	21.33	8.47	11.91	12.88	15.72	16.91	$14.55	13.46	16.58	17.55	23.28	32.28	35.97
Total fixed cost calculated	$1,514	1,561	1,264	1,202	1,267	1,417	1,413	$1,482	1,392	1,366	1,386	1,474	1,783	2,556

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* Sources: Figures for production, yield per acre, market price, and market value for all years except 1926 are from p. 39 of the 1946 volume of *Agricultural Statistics*, by the U.S. Department of Agriculture. Figures for 1926 are from the 1936 volume, p. 33.

Figures on production costs for each year are from the appropriate annual volumes of the *Department of Agriculture Yearbook* (1935 and prior years) and the separate *Agricultural Statistics*, 1936 and later.

Total production cost for each year is calculated by multiplying Net Cost per Bushel by Total Production in bushels. Total Fixed Cost is calculated by multiplying Total Production Cost by the per cent Fixed Cost per Acre bears to Total Net Cost per Acre.

These Department of Agriculture costs show that under the conditions chosen the growing of staple farm crops is a poorly paid business. In only 6 of these 14 years was the market value of the crop greater that its cost and 3 of the 6 were influenced by international short supply caused by war. In only 2 of the years included (1942 and 1944) was this profit substantial and both of these years were abnormal war years.

It should be remembered, however, that these costs include such implicit costs (costs not actually paid out) as rent of land (even though owned) and wages of management and farmer's labor not actually paid out as wages. Actually, the farmer risks his labor and capital and accepts payment for them at a rate to be determined by the ultimate cash value of his crop.

Table 9·3. Yield and Costs for Different Regions—1941

Region	Yield per acre	Net cost per bushel	Market price per bushel
Illinois and Iowa.........	51.7	\$0.48	\$0.75
Southwestern states......	15.0	1.18	0.75
Missouri and Nebraska...	26.4	0.63	0.75
Total United States ..	31.0	0.68	0 75

The Department of Agriculture statistics for corn show widely different costs of production for different regions caused mainly by different yields per acre. The yields, cost per bushel, and market price per bushel for 1941 are shown in Table 9·3 for different regions.

The figures of Table 9·3 do not mean that farmers in the Southwestern states lost money on their corn. The figures do mean that corn growers in these different regions received more or less than the prevailing rates of wages for their labor and more or less than the prevailing rent for their land. Also, it should be noted that a very large part of the corn raised in the Southwestern states is fed to livestock and cash income depends on the price of steers and hogs and only indirectly on the market price of corn.

The most important cost relation in farm operations is the low cash cost of putting in and cultivating the new crop when the farmer and his family furnish most of the labor. This cash cost of putting in and cultivating the new crop is the measure of the stake the farmer has to put up when he is faced with the decision to plant or not to plant. The fact that the farmer does plant year after year (except under the more speculative conditions of the dustbowl area and other marginal land) shows that the size of this risk is not too great. In the poorest year included in Table 9·2 the market value of the crop was about \$8.50 per acre and the total cost per acre was about \$13. The out-of-pocket cash cost of planting and cultivating the crop, however, is between 20 and 25 per cent of the total cost on the assumption that 75 per cent of the labor is furnished by the farmer and his family and that only 25 per cent is hired labor. On this basis the out-of-pocket cash cost (incurred before harvesting) for fertilizer, seed, tractor work, other equipment-operating expenses, hired labor, and miscellaneous costs would not exceed $3.25 per acre. The out-of-pocket cash cost prior to harvest is still less than half the market value per acre in the worst year of the depression. Based on the average year this "gambler's stake" is less than 30 per cent of average market value.

It should be pointed out that these cost relations apply only to staple field crops. For dairy products, out-of-product costs average 50 per cent or more of total costs. In poultry raising profit depends very largely on the relative market prices of feed and poultry. Cash crops such as potatoes, tomatoes, peas, and beans have higher out-of-pocket costs.[5]

But at least for the staple crops the farmer is better off if he works his land, at least up to the output determined by his own family labor. He would certainly lose family income if he reduced production. It is this relatively low cash cost of maintaining full production that makes this policy not only possible but more profitable than a policy of restricted planting.

To illustrate this point, one might imagine a farm operated without any obligated cash outlay of any kind. On this imaginary farm all labor is performed by the farm family or by men hired for a share of the gross cash income. Horses are used instead of tractors and all feed is raised on the farm. Grain is raised to feed livestock and no commercial fertilizer is used. Under these conditions actual cost of production, whatever the market

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[5] The ratio of labor costs prior to harvesting to total labor costs for growing potatoes is shown by the labor cost of growing and marketing potatoes in New York State:

1942–1945*

Job	Hours per acre	Per cent
Plowing and fitting	4	
Seed preparation	9	
Planting	4	
Cultivating, weeding, hilling	6	
Spraying and dusting	4	
Total up to harvesting	27	29
Digging and picking up	45	
Storing and marketing	21	
Total harvesting and marketing	66	71
Total	93	100

* Source: *Farm Economics*, New York State College of Agriculture, Cornell University, Ithaca, N. Y., September, 1948.

value of crops and livestock sold, is identical with market value. Cost literally is determined by market value. In effect, the wages received are fixed automatically by yield and market price.

At any given market price, no matter how low, the producer of corn receives a cash income directly proportional to the number of bushels of grain he produces. As long as market value exceeds his out-of-pocket cash costs, the farmer increases his net income by increasing his output. It is natural that the individual farmer strives for maximum production, regardless of price. Naturally he also strives for minimum cost and cash outlay in order to maximize his net income, and especially if he anticipates lower market prices.

Farmers, like manufacturers, restrict production whenever production leads to out-of-pocket loss. Specifically, farmers allow fruit to remain unpicked and field crops to be plowed under if the costs of harvesting, marketing, and transportation to market, in themselves, exceed total market value.[6]

These cost relationships have a number of interesting implications. They show why farming is typically an industry of small owner-operated units and why fixed cash obligations such as interest on borrowed money should be kept to a minimum. A general application of the corporation form of farm ownership and operation, with its large cash obligations for salaries and wages of management and labor, could not survive under the widely fluctuating prices for farm staples and under the full-production policy of the family farm. They show why the "dirt" farmer can earn a living where the "gentleman" farmer usually loses money.

The significant difference between farm operations and manufacturing operations from the standpoint of production policy is the difference between the cash cost obligations that the employer customarily incurs. Farming remains solvent in spite of widely fluctuating supply and market prices only because labor is largely performed by the owner and his family and because family wages are, in effect, determined by the market value of the product. In farming, the wage scale, so far as the farm family is concerned, fluctuates automatically with market value of the product, and cost of production and market value are one and the same. In manufacturing, very different relations exist; price and market value depend on cost of production because the manufacturer is obligated to pay cash for his material and labor. These are inherent differences in these two industries.

Manufacturing industry could survive under conditions of uncontrolled supply and uncontrolled market prices only if wages of factory workers decreased and increased automatically with the market value of the factory output, no matter what the value might be. It is safe for a producer to enter an open market with prices determined by unrestricted competition only if he is marketing his own labor or if he joins with other workers cooperatively to market their aggregate labor. All workers under such conditions face the risks of the unrestricted price competition. It should be apparent that modern manufacturing, with its large fixed payroll obligations for research and development of new products and new markets, is unable to face the financial risks of an uncontrolled-price market. Nor could rank-and-file wage earners in urban communities, where all living costs must come out of the weekly pay check, undertake the risks of the fluctuating wage scale and income as the farmer does. The average farmer survives these business risks only where his minimum living costs are independent of his cash income.[7]

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[6] In 1948–1949 picking, packing, and shipping Arizona grapefruit to eastern markets cost more per box than the wholesale price. Consequently, the fruit was unpicked on many ranches.

The wages (incomes) of farm owners are an obvious example of the basic principle that the volume of goods produced determines total real wages. In the farmers' case, production is measured by yield per acre rather than production per man-hour, as in manufacturing. And, it can be readily seen that the wage rate on the typical family farm is not a question of a just wage or a fair wage—or a living wage—it is a matter of impersonal yield per acre and market price.[8]

Those who admire free and open public markets, full production at all times, regardless of changes in demand schedules and unlimited price competition, can do so only from the safe vantage ground of a fixed annual income. They seldom recognize the untenable position of producers and wage earners under these conditions of unlimited competition. Free markets are safe for the employer only when, as with self-employed farmers and craftsmen, wages (actual or implicit) go up and go down in step with market price.

In farming demand is certain and relatively constant; supply and price are uncontrollable and are unknown in advance. In manufacturing demand is uncertain and for new products demand must be developed from scratch; supply and price are controlled to match the uncertain demand. In farming out-of-pocket costs to put in a new crop are small and constant in cost per acre and independent of the yield per acre. In manufacturing out-of-pocket costs to maintain production are large and increase in proportion to volume of production. They are too large to permit any appreciable excess of production over the quantity demanded.

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[7] This discussion is not intended to touch on the risk of unemployment faced by factory workers during periods of subnormal demand for goods. The discussion is limited to the risks of a wage rate determined by the free play of the forces of competition in a perfectly competitive market.

[8] An example of this automatic adjustment of wages to market price is given for potato growers in New York State, in *Farm Economics* of April, 1947, published by the New York State College of Agriculture, Cornell University. It shows that when potatoes sold for less than 80 cents a bushel, the return per hour of labor received by the self-employed farmer averaged 31 cents per hour (in various years from 1914 to 1941). There was a loss of 21 cents per hour when potatoes sold for 31 cents a bushel in 1931, and a wage of $1.07 an hour when potatoes sold for 67 cents a bushel in 1941. Then, in an equal number of years, from 1915 to 1943, when potatoes sold for more than 80 cents a bushel, the average wage was $1.02 per hour, with a high rate of $2.33 per hour when potatoes sold for $2.03 a bushel in 1925.

These inherent conditions of manufacturing were illustrated by the case history of an automobile manufacturer during the depression of 1937–1938 (as recounted in Chap. 8). They can be illustrated more generally by a hypothetical example based on average cost conditions. Consider a small plant producing machine tools that employs 100 men and that represents a capital investment of possibly $600,000. In a year of active demand output sold may be as much as $1 million. Apply to this output the typical cost relations of an average mechanized plant. At full output of $1 million the plant's annual fixed costs may be $200,000; variable costs, $667,000; and total cost, $867,000; profit (before Federal tax) is, therefore, $133,000. Under these conditions the break-even output is $600,000 or 60 per cent of capacity output. Now assume that in the following year because of depressed business conditions, sales of machine tools drop to $460,000, but *output is maintained at the former rate*. Total costs, therefore, remain $867,000. The only costs included in this figure that are not paid out in cash are depreciation and the owner's salary which together may be estimated not over $100,000. Out-of-pocket costs are $767,000 (as a minimum) and revenue is $460,000. The manufacturer faces certain out-of-pocket cash loss if he maintains full production in the face of seriously reduced demand. The typical grain farmer needs to spend out-of-pocket costs of only half his gross income under the worst depression conditions.

In a nutshell, it is this difference in out-of-pocket costs that explains why farmers maintain full production and employment and manufacturing plants do not.

Summary

This chapter extends the discussion of cost relationships to actual cost and profit conditions in manufacturing and farming. It explains the reasons for the full-production policy of farmers and the restricted production policy of manufacturers, although both farmers and manufacturers pursue the same goal of maximum possible profits.

One of the most important cost-revenue relationships in manufacturing is the proportion of fixed costs to total costs. Increased mechanization of large-scale industries has increased the relative size and importance of fixed costs.

Fixed costs are those that are fixed in amount and that do not vary in proportion to output. They are, however, fixed only for a budget period, and they do vary with the size or capacity of the plant.

Large fixed costs are indicative of high capital investment per worker and of large organizations for research, engineering, sales, and other staff activities. It follows that high fixed-cost industries are those that operate in controlled-price markets, have a small number of large firms, are relatively difficult for new firms to enter.

Large fixed costs greatly increase unit costs at low outputs and increase the pressure on management to maintain production at the highest possible level.

Variable costs are those that vary directly with output, like wages and materials that go directly into the manufacture of the product. However, neither are fixed costs unvarying with output, nor do variable costs change exactly in step with output. But for practical purposes, these simplifications do not make enough difference to affect management decisions. Fixed costs are assumed to be fixed (for the specific period under consideration) and variable costs are assumed to vary proportionately with output. These are the linear-cost relationships that were discussed in Chap. 5, and on which management decisions are usually based. They result in *decreasing unit costs* up to and beyond capactiy output in the typical mechanized factory, and are inconsistent with the assumption of increasing costs on which the static theory of equilibrium depends.

Manufacturing industries may be classified into low fixed-cost industries, such as wholesale and retail trade, personal services, or the needle trades. Such industries require little capital, and businessmen find it easy to start new enterprises or to abandon existing enterprises. Such industries are unstable and subject to extreme competition. They operate in relatively open, uncontrolled markets approaching, although only distantly, the theoretical market of perfect competition.

High fixed-cost industries are so usually because of large capital investment and large overhead staffs; it is difficult for new firms to enter such industries, and also difficult for existing firms to quit. Consequently, in high fixed-cost industries there are, typically, only a few large units.

The *break-even point* of a manufacturing plant is the output at which total revenue is equal to total costs. Consequently, it is the output at which the revenue line (Fig. 9 · 1) crosses the cost line. A high fixed-cost industry or plant has a relatively high break-even point. An increase in total fixed costs, or an increase in unit variable cost, or a decrease in average unit revenue results in a higher break-even point. In practical factory management, a high break-even point is dangerous to profits and solvency if the demand schedule is subject to wide shifts, as it is in the feast-or-famine steel industry.

Break-even points run from 40 to 60 per cent of capacity output in highly mechanized and highly engineered industries. This is the usual range in normal times. If wages and other costs are high relative to prices, as they were in 1946–1948, break-even points are increased, profit ratios (to sales) are reduced, and manufacturing plants are exposed to danger of serious losses if demand declines, even moderately.

Cost relationships determine the contrary production policies of farmers and manufacturers. Farmers plant crops, employing all their resources in good times and bad times; manufacturers cut down production and discharge workers when demand for their products declines. Both farmers and manufacturers, nevertheless, follow the same policy of attempting to maximize profits. It "pays" farmers to maintain full production regardless of demand. But it would bankrupt a manufacturer who followed the same practice. In farming, demand is certain and relatively constant; price is determined principally by the volume of supply; but income fluctuates less than price because low prices occur when crops are large.

In manufacturing, demand is uncertain, and for new products it must be developed from scratch. Supply and price can be controlled to match the uncertain demand.

Farmers can face the risks of their uncontrolled-price market because their out-of-pocket costs for full production are relatively low. They are low principally because farming is typically a family industry, and the farmer's family accepts the wages that the market offers, whatever they are. Manufacturers, on the contrary, incur responsibility for high out-of-pocket costs and cannot accept the financial risks of the uncontrolled-price market. It is the difference in out-of-pocket costs, together with the difference in demand conditions, that explains why farmers maintain full use of resources and manufacturing plants do not.

Review Questions

1. Calculate the break-even outputs of the automobile plant of question 5 of Chap. 8 under the following cost and revenue conditions:
   a. Fixed cost is \$8 million per month and variable cost (from 6,000 to 20,000 cars per month) is \$900 per car. What is the break-even output if the selling price per car is \$1,600; \$1,500?
   b. What are the corresponding break-even outputs if fixed cost is increased to \$10 million per month and variable cost remains at \$900 per car?
   c. If variable cost is increased to \$1,000 per car and fixed costs are \$8 million?

2. *a.* A plant manufacturing a variety of small tools has a maximum annual output of $1 million at current prices. Annual fixed costs are $200,000 and annual total variable costs are $667,000. What is break-even output?
   b. Assume fixed costs and prices remain the same but total variable costs are reduced to $600,000. What is the new break-even output?

3. In what way does a high ratio of fixed cost to total cost increase the risks in a manufacturing plant subject to fluctuating demand?

4. A Nebraska farmer obtained a yield of 30 bushels of corn per acre in a certain year. His total costs per bushel were 60 cents, and the price at which he was able to sell his crop averaged 80 cents a bushel. Because of predicted drought conditions, he could reasonably anticipate for the following year only one-half the yield per acre. This drought condition was not expected to be general, and the total U.S. supply and price were not expected to change materially. Costs per acre were not expected to change.
   a. Under these circumstances should the Nebraska farmer reduce his total operating costs by reducing the number of acres planted to corn?
   b. If he did reduce his acreage one-half, what would be the probable effect on his net income (gross cash income less all operating costs and charges)?
   c. What would be the effect on his cash income (gross cash income less all costs paid out in cash)?

5. *a.* Assume the same farm conditions except that yield per acre is expected to be the same, but world demand for corn is expected to decline and the price per bushel is forecast at 50 cents per bushel. Should the farmer plant his total acreage or reduce his planting?
   b. Would your answers be affected if the farmer owned one-half of his land and farmed the other half on shares?
   c. What should the farmer do if his land and buildings were mortgaged up to one half their current market value?

6. If a manufacturer of machine tools is faced by a marked lower demand for the following year, should he maintain production at the same level? In what respects does the manufacturer's situation differ from the farmer of question 4?

10. THE ROLE OF BUSINESS PROFITS

One of the conditions of the static economy (as described in Chap. 3) is that no surplus can exist. No factor of production can receive more than the exchange value of its contribution to production. In sharp contrast, a progressive, dynamic society must produce a substantial surplus or there can be no great progress. It is out of surplus goods and surplus time—after necessities are provided for—that better tools, better methods, better products develop. And money profits of business firms are one form in which this surplus is produced in a dynamic society.

The role of accounting profits is fourfold. In the first place, profit earned by business firms is one of the sources of funds for investment. Second, profit is reward for working and venturing; it is the incentive that leads men to risk their time and capital in all sorts of new ventures and undertakings: new inventions, new products, new businesses, and new industries. Third, profit or loss is one measure of the quality of management and makes possible the delegation of management responsibility and authority from owners to top management and on down to lower management and supervisory levels. And, finally, profit is the monitor or guardian that ensures efficient social use of the factors of production—natural resources, labor, and capital. Efficient use of resources is rewarded; misuse of resources is discouraged.

These different roles of profit cannot be entirely separated. They overlap to a considerable extent. Profit as incentive and reward is closely connected with profit as a measure of management. However, it will be convenient to treat them separately.

Profit as a Source of Funds for Investment. There is a popular but mistaken idea that profits are taken out of a business for the exclusive benefit and use of the owners, and that if profits were smaller, wage payments could be larger and social gains would accrue.

America's industrial power and wealth have grown largely from the profits of industry reinvested in the increase and improvement of industrial facilities. Many enterprises have grown from small beginnings into corporations of large size and financial strength because the owners plowed profits back into the business instead of hoarding them or using them for consumption purposes. Owners have increased their wealth, it is true, but the society has gained productive capacity and income equal, at least, to the owners' capital increase. And the income is generated annually, year after year.

In times of active business when large amounts of capital funds are being spent, business firms spend sums equal to all of their profits—and frequently more—on new and improved facilities. Profits properly used mean—not the ability to pay higher wages currently—but the ability to invest, the ability to provide more jobs and to pay higher wages in the future.

The popular opinion that large profits are a sign of labor or consumer exploitation—that because profits are large, wages necessarily must be lower or prices higher than they should be—is a fallacy that is responsible for much misunderstanding between organized labor and management. There is no fund of fixed size out of which wage payments and profits must come. The important principle of the productivity of industry (which will be explored in the next chapter) enters the problem. A progressive, well-managed industry or corporation can pay high wages, establish low prices, and earn large profits all at the same time. Increasing wage rates, with steady or lowered prices, are typical of the long-term trends in American industry. Under American experience wages and profits usually increase together and fall together.

Profit as Incentive. An important social role of profits is to encourage men to accumulate capital and to risk their time and capital by starting new enterprises—to make the extra effort on which progress depends. We shall see later on in this chapter that average profits, actually obtained over the years, amount to little more than the return on high-grade bonds—an investment which is accompanied by little risk and with little demands on the investor's own time. But the strength of the profit incentive is not dependent on this average rate. The real incentive is the opportunity to win the top prizes by greater skill and ingenuity, by greater enterprise and better judgment, by the divining of new needs, and the harnessing of new resources to earn more than the average profit.

The profit incentive is the force that governs the decisions of businessmen and gives coherence and a common direction to the millions of independent decisions and plans of American industry. Where the profit incentive has been discouraged or eliminated in an entire economy, production tends to lag and progress to disappear.

Profit as a Measure of Management. Profit or loss is the effective overall measure of the quality of management and the effective spur to good management. Profit or loss, by reason of this role of measurement of management, makes the large privately owned corporation practicable. It is only because the profit-and-loss accounting statement gives a measure of the quality of management that it is possible for management responsibility and authority to be delegated from directors to general officers and from general officers to the managers of individual factories or operating divisions of the corporations. It is, in fact, the profit-and-loss statement that makes the effective operation of "big business" possible.

An interesting lesson teaching the importance of profit and loss results as the measure and spur of management comes out of the experience of the U.S.S.R. when that country attempted to establish Soviet industry on the communist principle of "production not for profit but to satisfy consumer needs."

In the early years of the Bolshevik regime, production was carried on without thought of profit. Profit, in fact, was frowned upon by the more theoretical and idealistic communists. There was a strong opinion that state factories should not strive to earn a profit.

Thus, the state provided raw materials and working capital; the factories produced what they could and the state made up any losses. The factories at first were managed by workers' committees, but almost complete disorganization resulted. Workers' committees were replaced by a three-cornered authority of technical plant manager, party chairman, and labor-union representative.

As early as 1923, the twelfth Congress of the Communist party resolved that "a country's industry can be victorious only if it yields more than it absorbs," and the Congress decided that all factories and other producing enterprises should work, as far as possible, on the principle of "business accountability"—which meant: operate without loss and achieve a profit.

Thus at this early period of the communist experiment, the more practical leaders discovered that state factories could not be operated successfully according to communist principles, but must follow the capitalist principle of the profit incentive. They discovered that the requirement of profit is the most effective spur to good management, and that without pressure on management for profit, management tends to grow lax, careless, and extravagant.

About this same time the entire state production and distribution system failed to meet the expectations or needs of the people, and the Bolshevik leaders again abandoned temporarily communist principles in favor of the more effective principle of private profit. The breathing spell of the New

Economic Policy was authorized, which permitted a considerable measure of private ownership and use of private capital for establishing small factories and stores.

One Soviet economist observed: "State subsidies [to cover plant losses] created an attitude of dependence and irresponsibility on the part of some Soviet managers, thus weakening the effects of business accountability."

Subsidies to cover losses were found also to lead to complete neglect of plant finances. "Why worry, the subsidy will always cover losses."

Since 1936, subsidies have been frowned upon by the party, and discontinued wherever possible: "The desire to increase profits has become a real incentive to more responsible, active and careful management."

The incentive value of the profit motive (or "business accountability," as the communist economists prefer to call it) is increased in Soviet industry by allowing successful managers to retain a small part (4 per cent) of planned profit and a large part (50 per cent) of profits earned in excess of the planned profit. The retained profits make up a "manager's fund." The planned profit is a profit budget set by the headquarters planning organization.

Not less than one-half of the manager's fund is to be used for housing employees; the remainder for other "social" services, and for bonuses for outstanding work. The manager's fund and its distribution serves to increase a successful manager's social position and prestige. It operates to strengthen the measurement and incentive function of profits.[1]

The Profit-and-Loss Yardstick in Private Enterprise. The principle of private enterprise that makes decentralization of initiative and authority possible is individual responsibility for solvency measured by the impersonal profit-and-loss yardstick.

Individual solvency and the profit-and-loss yardstick, together with the price system, govern and regulate the manifold operations of private enterprise. Working together they determine what goods will be made and what services will be rendered. They enforce the decisions of the customer. If costs are higher than the market will pay, or if goods produced are not desired by the market, the unsuccessful firm or the unsuccessful manager soon disappears.

The distinguishing mark of private enterprise is this responsibility for solvency placed on the shoulders of the individual and the individual enterprise. The virtue of the profit-and-loss test is that it provides means by which owner and general manager can survey the final results without following the details. Without the profit-and-loss account, "success and failure would remain unrecognized in the dark."

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[1] The quotations and facts given in this account are from a research study conducted by the New School for Social Research of New York City. The study covers conditions up to the outbreak of war in June, 1941. The results are published in the book "Management in Russian Industry and Agriculture," by Bienstock, Schwartz, and Yugow, Cornell University Press, Ithaca, N. Y., 1944.

In private industry it is possible to delegate wide powers to local plant managers because power can be controlled through the profit-and-loss statement. The quality and results of management can be measured month by month and year by year. Control over millions of dollars of other people's property can be delegated with safety and assurance with the simple but comprehensive instructions: preserve these assets from serious loss and make them earn a profit, if possible. It is the economic version of the Biblical parable of the talents.

The control devices that make this delegation of authority possible in the large corporation are the annual profit-and-loss budget to control day-by-day operations, and the annual capital-appropriation budget that covers the plans for new and improved facilities. These budgets, together with the general policies established by the headquarters management of the corporation, constitute the full instructions or regulations for the local plant manager. He is judged by the financial results of his management and his ability to increase the value of his unit to the corporation, and never, in the first place, by his blind compliance with official regulations.

The yardstick of profit and loss is the instrument of private enterprise that enforces economy in operations, reductions in the cost of product, and increase in production per man-hour. Management decisions continually depend on the answer to the question: Will it pay? If a new machine tool, a factory rearrangement, or a new storekeeping system will reduce costs more than it will increase costs, the local manager can be allowed to make the decision because the results, good or bad, can be measured and will inevitably come to light in the profit-and-loss statements.

The profit-and-loss principle is the monitor and watchdog that keeps the system of private enterprise efficient and healthy and assures economic progress. Those who have had experience in the management of industry do not need to be told that even good managers grow lax and inefficient as soon as the necessity for economy is removed. Few managements could withstand the easy life of continuous prosperity. Any executive who, in his day, has battled against the rising tide of desirable but unnecessary spending during flush times, and has struggled to recover his preboom profit position, knows how easily costs grow higher and how difficult it is to cut them down. During the Second World War production was given the right of way. Costs were secondary. All possible and legal demands by labor were granted. Necessary speed was obtained by the lavish use of men and materials. Troubles were overcome by making all suggested remedies simultaneously, where in peacetime changes would have been made one at a time. One of the most difficult reconversion problems of American industry was reestablishing the primacy of costs and getting back to prewar ideas of economical organization and spending.

If the incentives and the opportunities associated with profits are lost or materially weakened, rank-and-file workers and society as a whole will suffer in the long run from the increased costs and wastes in industrial operations.

Making a profit should not be looked on as a social crime. As a matter of fact, the managements which do not make a profit are the social and economic sinners.

The Profit-and-loss Yardstick in Government Enterprise. The distinguishing mark of government enterprise in the United States is the lack of individual responsibility for financial results. There is little, if any, pressure on individuals—no matter how exalted in rank—for maintenance of the financial strength and solvency of a government enterprise. The financial responsibility of officials and managers of government enterprise is limited to the legality of expenditures within the limits of Congressional appropriations. There is meticulous examination of all government expenditures by various auditing departments of the government, topped by the Comptroller General's organization, but only from the standpoints of legality and personal accountability. There is little cost accounting in government enterprises as private industry knows it. In government arsenals, manufacturing costs are charged against a number of different appropriations, and a complete cost of a single product is seldom known. Balancing of total costs of operations against the market value of the product is not attempted, and probably would be opposed.

The primary objective of a government enterprise is usually a service of some kind. Cost, at best, is a secondary consideration. There are, it should be recognized, areas in which profit should have no influence, as, for example, in the supply of many necessary government services. But even in this field, the yardstick of no loss or of least cost would be a valuable guide.

The absence of the necessity for taking current cost into account is frequently advanced as an advantage that government operation of industry possesses over private operation. Government, it is claimed, need not consider the immediate cost. Governments can look ahead to the advantage of future generations in the conservation of natural resources and in the economic development of backward regions. Governments can supply services that have no immediate market value, but do serve major social and cultural ends.

These statements are all true, and the conservation of national resources and advance in social and cultural values may be highly desirable. There is a catch in this plausible argument, however, and it becomes plain if the entire national economy is imagined to be operated on this social-standard basis. Then, operations that do not pay their way in an adequate return for the labor expended, can be paid for only by a decline in total exchangeable production and ultimately by a decline in the standard of living. These unprofitable operations are forms of investment that must be paid for out of current production. Nonprofit operations can be undertaken in this completely government-operated economy only to the extent that other and more profitable undertakings support them. Money costs and losses are also labor costs and losses. When labor is expended without the production of useful result, total useful production is reduced and the "more profitable" workers must support the "unprofitable" workers in some degree.

Without a profit-and-loss yardstick to measure the quality of management in government enterprises, bureaucracy falls back on voluminous manuals of regulations and instructions to govern and control delegated power. The mark of government administration is its dependence on and respect for "regulations" and the official "record" of its personnel. The main objective of too many government officials in the permanent services is not so much efficiency and initiative as it is the avoidance of mistakes that would mar their official records. Unfortunately for the many progressive, conscientious officials in government service, outstanding achievement is more difficult to measure "for the record" than are minor infractions of the regulations. No credit can be given for initiative and willingness to take a chance. "Sticking one's neck out" may be highly unprofitable for the adventurous individual in government service.

There are no powerful, effective incentives in government enterprise to reduce costs and expenses and to increase productivity. On the contrary, in many agencies of the government the importance of a department or agency and the size of its operating budget is measured by the number of its employees because there is no other measure. Government factories are prevented by act of Congress from using an incentive wage system based on measuring instruments, such as stop watches. The high unit costs and expenses of government operations may not be important when they make up only a few per cent of the national production, but these characteristics of government administration could be crucial if even a few major industries came under government control and management.

Under state planning the results of inefficient and wasteful use of labor are not immediately apparent and may continue indefinitely. High costs do not immediately affect the solvency of the state. The wasteful use of labor does result in a roundabout fashion in reduction in the value of money and in higher prices for goods. The workers and consumers generally pay without their knowledge or consent through a lower standard of living for the inefficiency of state management. But under private enterprise, inefficiency of management cannot be hidden. It is shown up by high costs, by disappearing working capital and, unless the losses are stopped, by ultimate bankruptcy.

The customer in the private enterprise system cannot be forced to pay for poor management as he can be forced to pay taxes. The inefficient private planner soon changes his methods or he goes broke.

Investment of capital in a government project usually is limited only by the appropriations that can be secured from Congress and not by estimates of its future earning power. The head of a government agency is judged by his ability to secure appropriations from Congress rather than by his economical use of capital and by the money return he may earn. Again, this may not be important when government agencies operate only a small part of industry. But it would be highly important if the same extravagant use of capital resources were applied to the entire economy.

The characteristic lack of emphasis in government enterprises on profit and loss and the absence of necessity for solvency of the single enterprise constitute a handicap on efficiency under planned economy that is difficult to assess and to overcome. The innate human love of spending, doubly justified by a worthy social objective, will not be denied. Only the rare executive in government service can withstand this natural desire to expand his department and is able to place operating economy ahead of size.

This is no captious criticism of government administrators. Economy and financial solvency would be no more common in private industry if these virtues were not enforced by the limited financial resources of private enterprises and by the profit-and-loss statement.

The necessity for solvency and profits in private enterprise is the cleansing prophylactic that protects the economy against the fatal diseases of inefficiency, poor judgment, and laziness. Without the necessity of earning a profit, the private economy would be less productive, less able to advance the material welfare. "Social objectives" would be unattainable.

Profit as the Guardian of the Social Capital. The final role of profit is closely associated with the role of profit as the yardstick of management. This final role is to select, from among the millions of would-be managers, those who are most competent to manage the private enterprise economic system; to select the managers who will exercise control over the productive resources of the nation. Managers who possess energy, initiative, resourcefulness, and ability to earn profits are those who accumulate capital and exercise more and more power over the available resources of the nation. Those who lack these superior qualities fail to earn profits and so lose their power over capital. Those who increase the "talents" entrusted to them are given still more power and authority; those who fail are punished, and the "talents" entrusted to them are taken away. Business losses, if continued, eliminate the inefficient owners and managers. The necessity for solvency guarantees that the country's capital, labor, and natural resources will be used most economically by the most skillful managers and that the greatest volume of goods will be produced for the least practicable expenditure of resources.

Imagine the situation if the reverse of this situation prevailed; if, for example, any individual who desired to build and operate a factory could obtain the necessary funds from some imaginary source, and if additional funds for operating capital would be forthcoming without regard to operating profit or loss.

Relation between Profits and Output. Profits and wages are the chief sources of controversy in modern times concerning the distribution of the products of industry to the factors of production. These shares—profits and wages—go to different factors or groups. In earlier times there was similar controversy among other groups. Landowners, the owners of manufacturing plants, and the owners of money capital argued over the distribution of rent to land, wages to labor, interest to capital, and profits to management.

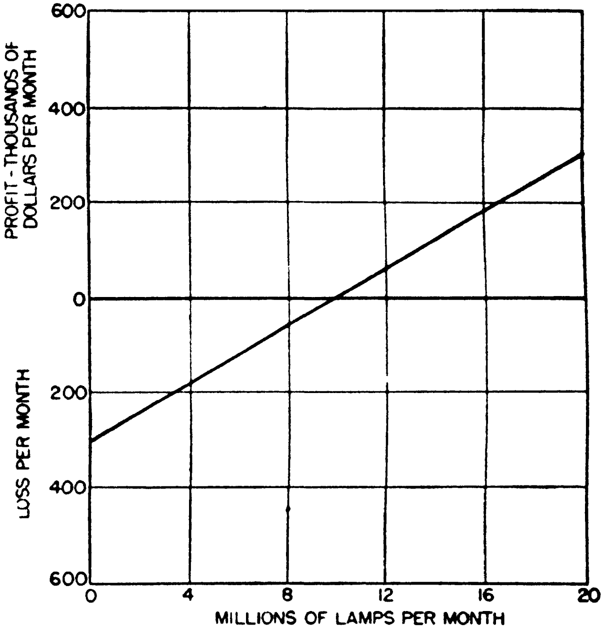

Fig. 10 • 1. Profit or Loss at Different Outputs

Because of the effect of fixed costs, losses are incurred at low outputs in manufacturing and profits increase at a higher rate than output at large outputs.

This modern controversy over the shares of management and of labor in the product of industry is influenced greatly by the different ways in which wages and profits vary with output. It will be desirable, therefore, to explore the relationship of profits with output before considering the ultimate question of the relationship of profits to payroll costs.

The normal relation of profit to output is shown by Fig. 10 • 1, which is a modification of Fig. 9 • 1. In Fig. 9 • 1 loss is indicated at small outputs by the location of the cost line above the revenue line, and profit is indicated at larger outputs by the location of the cost line below the revenue line. In Fig. 10 • 1 these values of loss and profit are plotted directly against output. The break-even point is the output at which the loss-profit line crosses the horizontal axis of no-loss–no-profit.

As with costs, the loss-profit line is made up of two components—fixed loss which is equal to fixed cost, plus a variable total profit which is determined by the profit per unit of product or per dollar of revenue. The slope of the loss-profit line of Fig. 10 • 1 is fixed by the relation between cost and revenue, and principally by the ratio of wage rates to market prices. Under normal conditions these, in turn, are fixed by competitive conditions within the industry. A low fixed-cost industry will usually have a smaller inclination of the profit line and a high fixed-cost industry will have a more steeply inclined profit line. Profits in the latter case, however, are seriously reduced by the high fixed costs.

Thus, in high fixed-cost industries, there is a large initial loss (at zero output), which is equal to the fixed costs. But there is a compensating large profit per unit of output or per dollar of sales revenue, and consequently a steeply rising profit as output is increased. There is also a relatively high break-even point.

In high fixed-cost industries, profits are low (or losses may be incurred) up to 50 or 60 per cent of capacity output. Then profits increase rapidly with higher outputs. These relationships pose a difficult management problem for the manufacturer in high fixed-cost industries typified by steel and heavy machinery. If an individual manufacturer is able to adjust his costs and selling prices to provide a reasonably low break-even point, then profits at capacity volume will be large. In boom times he is vulnerable to demands for wage increases from labor and for price reductions from government and the public. If he accedes to either of these pressures, he will increase his break-even point and face the probability of large losses when demand declines.

The dilemma of management in high fixed-cost industries is that profits are inherently large at capacity operations, but cannot be reduced with safety if the industry is subject to wide shifts in its demand schedule. Here management judgment must be exercised to strike a safe relation among costs and revenue and break-even point with due regard to probable fluctuations in general demand.

These conditions make it possible for management to increase wage and salary payments during capacity operations, providing some way is open to reduce these payments when output drops and the break-even point is approached or passed. Profit sharing provides one method of increasing payments to employees when high profits are being earned and automatically eliminating the additional payments when profits disappear. Another and simpler method is to pay employees some fixed per cent of total revenue whenever this percentage exceeds regular wages and salaries.

With the more familiar profit-sharing plan, some part of profits is distributed to employees in addition to wages or salaries. A few profit-sharing plans have been conspicuously successful, largely because of confidence of employees in the fair dealing and honesty of management. Also, profit sharing is most likely to be successful in industries that have a low ratio of payroll costs to revenue—where labor costs are relatively low and material and other costs are relatively high.

The relation of total payroll costs to total revenue at capacity output varies widely in different industries depending on the composition of total costs. The average pit coal-mining operation has a payroll cost of about 60 per cent of the value of the output at the mine. An integrated steel company that produces its own ore, limestone, and coal, and carries its mill operations to rolled and fabricated products, also has a high labor content in its total costs. Electrical machinery manufacturers have a payroll ratio of 35 to 45 per per cent of the dollar value of total output. At the low end of the scale are electric public utilities, oil refining, and chemical companies, where the processes are largely automatic. In these industries, payroll costs are only from 10 to 15 per cent of total revenue at capacity output.

These ratios apply to payroll costs of the individual enterprise. Considering all manufacturing industry as one integrated enterprise, practically all costs are labor costs. The cost of pig iron to an iron foundry, for example, is largely labor cost for mining and transporting the iron ore, coal, and limestone used in the production of pig iron. For the national economy as a unit between 70 and 80 per cent of the market value of the national product is compensation for labor of one kind or another.

One practical problem with profit sharing arises from the arbitrary and variable composition of accounting profit. Accounting profit depends to a considerable extent on management policy in setting up reserves to protect against future losses, in handling inventory charges and credits, and in charging development costs and other costs related to future production as current expense. Unless there is a feeling of mutual confidence between labor and management, there will be many differences of opinion concerning the calculation of accounting profit and, consequently, the size of the profit that is to be shared. Accounting profit is, after all, a bookkeeping calculation.

The second principle—payment of some fixed percentage of total revenue to employees—has the practical advantage of avoiding these questions concerning the calculation of profit. Additional payroll payments depend only on the amount of total revenue. This second principle may be illustrated by the plans that have been successfully used by two concerns: the Nunn-Bush Shoe Company of Milwaukee and the Bundy Tubing Company of Detroit. In the Nunn-Bush plan workers are paid total wages and salaries equal to 20 per cent of the sales value of the product without any minimum guarantee. This plan is illustrated, in principle, by Fig. 10 • 2. Under the assumed payroll ratios, workers receive less than their 'base" rates with outputs less than 75 per cent of normal capacity (indicated at *B*), and they receive more than their base rates at outputs above 75 per cent. The lack of a minimum guarantee would be acceptable to labor only when there is relatively small shift in demand schedules and output from boom to depression. Plans of this kind are practicable only in industries in which there is little change in the nature (and labor content) of the product from year to year. This plan has been in use in the Milwaukee plant of the company since 1936 and weathered the 1937–1938 depression successfully. If there were a minimum guarantee, actual payroll payments would follow the line ABC in Fig 10 • 2.[2]

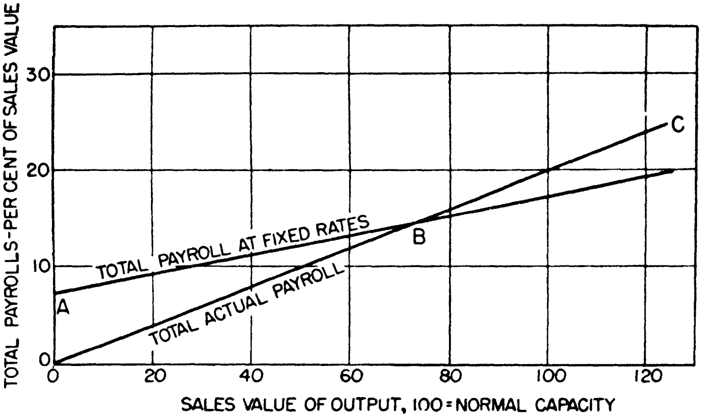

Fig. 10 • 2. Wage and Salary Payments under Nunn-Bush Plan

Workers under this wage payment plan receive a fixed per cent of the dollar value of factory output—in this case, 20 per cent. Workers receive less than a fixed base wage up to 75 per cent of output (*B*) and more than a fixed base wage at higher outputs.

In the Bundy Tubing plan additional wage payments are made above the guaranteed base rates equal to one-half the excess, if any, of 30 per cent of the sales value of output over total base payroll cost. This plan is illustrated by Fig. 10 • 3 in which the actual payroll costs follow line ABC.

Both of these plans possess the advantage and the weakness that they are plant-wide in application. In the Nunn-Bush plan, all employees benefit in proportion to their base wages or salary. In the Bundy plan, all hourly employees share equally in the distribution without regard to base wage.

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[2] Beginning March, 1948, the plan was changed to pay employees 36 per cent of total revenue *less raw-material costs.* This is equivalent to 36 per cent of the value added to raw materials by labor in the plant. In another plant of the Nunn-Bush Shoe Company, the plan was discontinued during the war because of the large number of skilled operators who were called into military service. Up to April, 1949, the plan had not been reinstated.

Such group plans cannot take the place of individual or smaller group incentive wage payment plans, based directly on individual or small-group production.

Relation of Profits to Payroll Costs. We can now examine the theoretical or normal relationship of profits to payroll costs at different outputs. Payroll costs vary with output in much the same fashion as total costs. Payroll costs have a large fixed component derived from salary payments included in fixed costs. In one example payroll costs were approximately 70 per cent of total fixed costs.[3] The variation of total costs with output is shown in Figs. 5 • 1 and 9 • 1 of Chaps. 5 and 9, respectively. Figure 10 • 4 shows the similar variation of payroll costs with output. Figure 10 • 4 also shows the corresponding relation between total profit and output for a firm in a high fixed-cost industry such as electrical equipment.

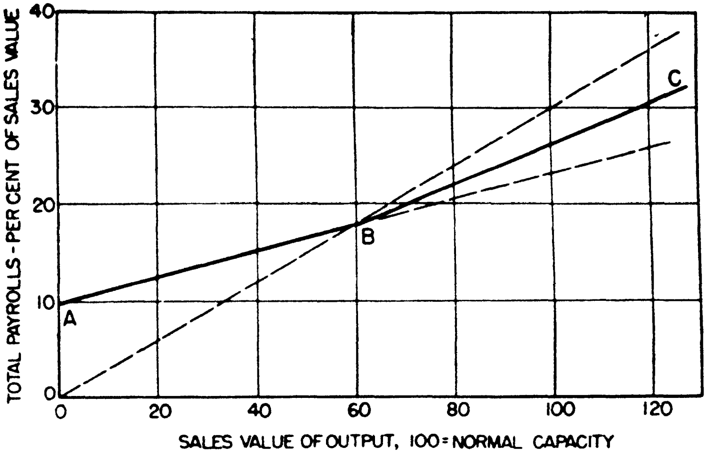

Fig. 10 • 3. Wage and Salary Payments under Bundy Tubing Plan

Workers under this wage payment plan receive wages at their base hourly rate up to 60 per cent of total factory output, and above this output they receive a premium wage (*BC*) which for any pay period is one-half the excess that 30 per cent of the sales value of the total output bears to total base payroll, calculated at base hourly rates. In this plan the worker receives base wages or more at all times.

Simple inspection of Fig. 10 • 4 shows that the ratio of profits to payroll costs varies at different volumes of output.

In the example shown, at 80 per cent of capacity output, profits are about 7 per cent of output, and payroll costs are approximately 31 per cent of output. At 120 per cent of capacity output, profits have increased from 7 per cent to approximately 20 per cent of output, while payroll costs have increased from 31 per cent to about 39 per cent. Thus, over this range of output, payroll costs increased about one-quarter, and profits increased nearly 200 per cent. To make a fair comparison it is necessary to consider average profits and average payroll costs over the range of output typical of the particular firm or industry. If the comparison is made for two or more specific periods, any change in relative outputs should be given due consideration.

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[3] Refer to Table 9 • 1, p. 181.

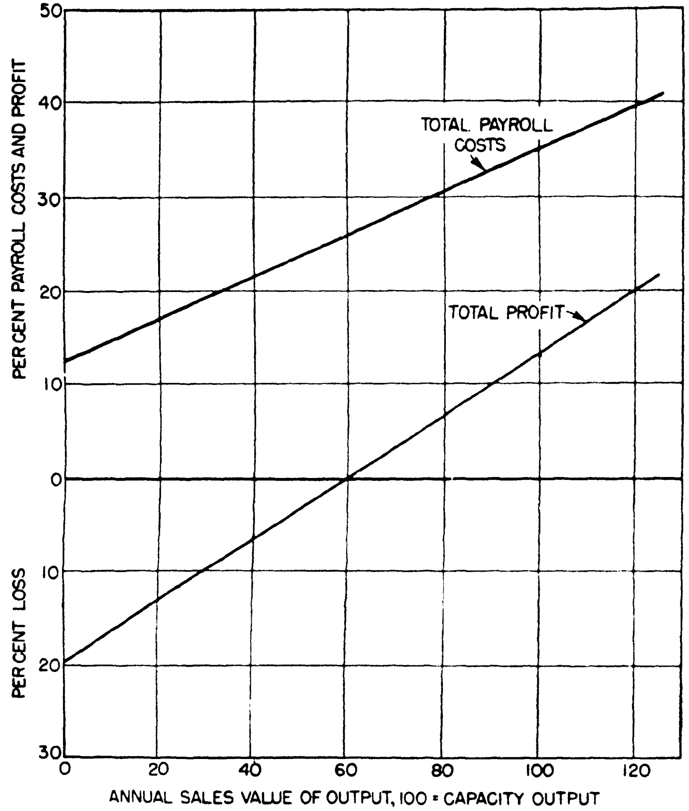

Fig. 10 • 4. Relation between Profits and Payroll Costs

Because fixed costs add to payroll costs at low outputs, and subtract from profits, the way payroll costs and profits increase with output differs widely. Profits increase much faster. This fact should be taken into account when payroll costs and profits are compared.

The Size of Profits. What does society pay for management of its material resources? Not very much! Profit is sparingly distributed. In the highly prosperous war year of 1917, according to the U.S. Treasury Department, one-third of all corporations in the United States reported a loss. In all other years since 1913 a larger proportion suffered losses. In the most prosperous interwar year (1941), only 56.4 per cent of active corporations made a profit. In the relatively good year of 1937 only 40 per cent of the reporting corporations kept out of the red. Profits in American industry, despite the fact that it is the most successful industry in the world, do not come easily and have been declining in per cent over the past 30 years.

Profits tend to disappear in strongly competitive markets. Profits tend to be lower in industries where fixed costs are low, capital requirements small, and risk consequently small. Expressed in another way, the rate of profit in actual industry tends to be a constant per cent of the capital required. Rate of profit on sales is low where volume of sales is large per dollar of capital, as in meat packing, retail trade, the processing of staple foods, and the manufacture of the simpler kinds of clothing. The rate of profit on sales tends to be higher in new, rapidly changing industries, where development costs and risks are large, and in industries such as steel, automobiles, and other heavy equipment industries, where investment is large and where natural conditions result in the continued existence of a small number of large concerns. Rates of profit tend to be higher in new industries than in old established industries turning out staple, standardized necessities.

The size of profit also depends on the continued progress of an industry; as products are improved in quality and reduced in cost of production as the result of technical research and development, these gains show up temporarily as increased profit for the progressive and able pioneer. But under competitive conditions and labor pressures these additional profits tend to disappear in wage increases or in price declines. These temporary profits generated by technological progress can be continued only by continued technical advances. A permanently high level of profit in competitive industry can be maintained only by continuous technical changes leading to lower and lower production costs.

This principle can be observed in the operations of actual industry The industries that possess inherently high profit opportunities are the progressive industries. The industries that have low-profit possibilities are the stagnating industries, ruled by traditional methods and ideas, or those industries that produce staple standardized products. Progressive, profitable industry is in a permanent state of disturbance and struggle.

There is widespread popular misconception of the size of business profits. Public opinion surveys show that people have an exaggerated idea of the size of profits. In one nation-wide survey conducted among rank-and-file wage and salary workers 11 per cent of those questioned thought that average profits amounted to 50 per cent. Forty per cent believed that average profits were 25 per cent or more. One-third of all the people interviewed had no opinion.[4]

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[4] Confidential survey made in May, 1946, by the Public Opinion Index for Industry, Opinion Research Corporation, Princeton, N. J. Quoted by special permission.

National product statistics compiled by the Department of Commerce show corporate profits after taxes to range from a high figure of 8.1 per cent of the sales value of total national output in 1929 to a loss of 5.9 per cent of national product in 1932. In 1946 and 1947, corporate profits were 6.2 per cent and 7.8 per cent, respectively, of national product. These figures should be doubled if corporate output alone is used as the base.

Table 10·1. Distribution of Income—72 Large Corporations—1945

	Millions of dollars	Per cent of income
Total income (sales)	$33,560	100.0
Paid for materials and services	21,559	64.2
Taxes	2,015	06 0
Salaries and wages	8,436	25.2
Dividends	998	03.0
Retained profits	552	01.6

The distribution of income and the resulting profit (after tax) for 72 large industrial corporations having total assets of approximately 27 billion dollars, nearly 3 million employees, and 4 million stockholders, is shown in Table 10·1. The figures are for 1945 and represent the abnormally low profit (after tax) of large corporations under war conditions.[5]

A much larger sample of 2,806 leading corporations earning net income (profit) based on capital invested (or net worth) instead of sales is shown in Table 10·2. Annual volume of sales is roughly double net worth (investment is "turned over" twice) so that percentages based on net worth are roughly double the percentages based on sales. This ratio did not hold during the war years when production was greatly expanded by government-built plants.

Table 10·2. Net Income of Leading Corporations—Based on Net Worth

Year	Per cent of net worth	Year	Per cent of net worth
1936	7.4	1941	9.2
1937	7.2	1942	8.7
1938	3.8	1943	8.6
1939	6.2	1944	8.2
1940	7.4	1945	7.6

The aggregate size of corporate profits is important to every citizen as well as to workers and corporations. Corporate business originates about one-half of all national income, so the ability of corporate enterprises to expand and to improve their facilities and equipment, for which adequate

[5] The National City Bank, New York, *Bulletin* of June, 1946.

profit is the first essential, is important to the entire economy. Corporation profits after payment of Federal income tax amounted to 3.8 per cent of gross national product (or approximately between 7 and 8 per cent of the market value of the output of corporate enterprises) during 18 years between and including 1929 and 1946. These realized profits of corporations, amounting to some 80 billion dollars, have been used to pay dividends to owners (shareholders) and partly to increase and improve production facilities.

Summary

The accumulation of a surplus of goods currently produced over goods currently consumed is essential to progress in a dynamic society. Profits earned by business firms are one form in which this necessary surplus appears.

The role of profits is fourfold: They are, in the first place, one of the major sources of *funds for investment*, and therefore one of the major sources of progress; secondly, the opportunity for profit is the *incentive* that leads men to save and to undertake new ventures, and which governs and controls the operations of the system of private capitalism; third, profit or loss is the *measure of the quality of management* and makes possible the delegation of management responsibility and authority, thereby making possible the efficient operation of large enterprises. Finally, profit is the *monitor* or guardian that ensures the most effective use of the scarce factors of production—natural resources, labor, and capital.

Relation among Profit, Output, and Costs. The major controversy in modern industry over the distribution of the products of industry among the factors of production—land, labor, capital, and management—lies between labor and management as to the relative size of wages and profits.

Because of large fixed costs, mechanized manufacturing enterprises suffer losses at small output. At zero output the loss is equal to fixed costs. There is also a variable profit that gradually overcomes the constant loss as output increases; at the break-even point the constant loss is just offset by the variable profit. This point is typically 50 to 60 per cent of capacity output. At larger outputs the profit increases at a relatively high rate.

High fixed-cost industries inherently have a high break-even point and, if successful, have a high variable profit per dollar of sales. Profits may be more than necessary at capacity output if capacity output could be maintained. Profits could be reduced, of course, by increasing wage and salary scales or by reducing market prices. But either of these actions would increase the break-even point still more and increase the vulnerability of the enterprise to loss with any appreciable reduction in demand. And if demand declines, it is obviously undesirable to increase prices and impossible to lower wage and salary rates (except in the event of prolonged depression). The dilemma of management is that profits are large at capacity operations, but cannot be reduced with safety if the industry is subject to wide fluctuations in demand. Here judgment must be exercised to strike a safe relation among costs and revenue and break-even point, with due regard to probable fluctuations in general demand in the specific industry.

These conditions justify profit-sharing plans, whereby payroll expenditures may be increased during periods of high output when profits are relatively high and automatically reduced as output declines and profits disappear.

Relation of Profits to Payroll Costs. Payroll costs vary with output in much the same fashion as total costs. There is a large fixed component of payroll costs arising from the salaries included in fixed costs. There is also a variable component arising from labor that varies with output.

At low outputs, therefore, payroll costs are appreciable; at larger outputs payroll costs increase. On the other hand, the typical mechanized enterprise operates at a loss at low outputs; the loss changes into a profit at the break-even point; and at outputs above the break-even point profits increase more rapidly than output and payrolls. It is typical of high fixed-cost industries that over a period of increasing output payrolls will increase by a much smaller per cent than will profits. This inherent behavior of payroll costs and profits should be taken into consideration when comparisons are made.

The Size of Profits. To those not familiar with the operations of business, it may appear that profits develop automatically, but from the inside profits are known to be illusive and difficult to earn. From one-half to one-third of all American corporations fail to earn a profit—even in good times.

Profit tends to be a fixed per cent of the capital required in a business. If annual sales volume is large in proportion to invested capital—as in merchandising—profit per dollar of sales is usually low. If annual sales volume is relatively low, profit per dollar is higher.

Profit also varies with the nature of the busness. In stable industries in which development costs and risk are low, profit (in per cent of sales) is also low. In rapidly changing, progressive industries the rate of profit tends to be higher.

The average rate of profit is lower than is commonly believed. Profits (after tax) of 72 large American corporations in 1945 were 4.6 per cent of income from sales. This figure is low because of war conditions. Profits based on capital invested (net worth) varied from 3.8 per cent in the poor year of 1938 to 9.2 per cent in the good year of 1941. In 1945 profit based on net worth was 7.6 per cent. During the 18 years from 1929 to 1946, inclusive, profits of American corporations averaged about 8 per cent of the market value of their product. It is apparent that profits of this size are not large in relation to the important role of profits in a progressive, dynamic economy.

Review Questions

1. How well do you think the American system of private capitalism would work if business profits were completely taken by the Federal government by taxation?

2. Under the complete national ownership system of the Soviet Union and under the nationalization of certain basic industries in Great Britain, the government, in effect, takes over all profits of the nationalized industries. What effects on the economy of management and on the standard of living of the two nations would you anticipate?

3. In January, 1949, President Truman recommended that the Federal government build and operate blast furnaces and steel mills to increase the steel ingot capacity of the United States if private corporations would not undertake the amount of expansion the government recommended.
   Assume that the Federal government entered into this program and ultimately owned and operated the entire pig iron and steel-making facilities of the country.
   a. Would you expect this nationalized industry to use more or less invested capital per ton of steel produced than was used by the privately owned and operated industry in 1948?
   b. To use more or less labor per ton of steel?
   c. To produce more or less dollars' profit per dollar of sales value of steel sold?
   d. Are these three factors important in determining the standard of living of the people of the United States, especially if the nationalization program were extended to other major industries?

4. Secretary of Commerce Charles Sawyer is reported as saying (in *Time*, Jan. 10, 1949):
   a. "In some cases price increases have been more than necessary to cover costs and have contributed to the inflationary spiral."
   Senator Joseph O'Mahoney said:
   b. "My theory is that any industry earning excess profits from full employment or Government contracts should pay more taxes."
   President Holman of the Standard Oil Company of New Jersey said:
   c. "Without our high profits we couldn't have expanded the way we did."
   These three statements may be interpreted to mean: (*a*) that with increasing prices the dollar size of profits should not increase; (*b*) high profits resulting from high production should be taxed away; (*c*) high profits are necessary for expanding industry. Which of these aspects of profits do you consider favorable or unfavorable to the interests of the whole economy?

5. *a*. How were the profits of the U.S. Steel Corporation distributed over the years 1902 to some recent year? (Refer to any recent U.S. Steel Annual Report for the

figures.) Summarize distribution of profits to preferred stockholders, common stockholders, and profits retained by the corporation.

b. Do you consider the distribution of profits desirable or undesirable from the standpoint of the whole economy?

c. When the U.S. Steel Corporation was formed in 1901 by merging many steel companies, something over 100 million dollars of common stock was issued based only on "good will." Do you believe that the amount of the capitalization of the U.S. Steel Corporation affected the price of steel products, or that the American consuming public suffered economically because of the initial overcapitalization of the U.S. Steel Corporation?

d. Do you believe profits earned over the years by large corporations, such as U.S. Steel, can or cannot be justified economically? Give reasons.

6. In 1939 the gross national production amounted to about 90 billion dollars, corporate profits (before tax) amounted to 6.5 billion dollars; and total wages and salaries of employees amounted to about 48 billion dollars. In 1947 the corresponding figures were gross national product, 231 billion dollars; corporate profits (before tax), 30 billion dollars; compensation of employees 127 billion dollars (also before tax). Thus, while total production increased 157 per cent, corporate profits increased 360 per cent and wages and salaries increased only 164 per cent.

a. In your opinion does the larger percentage increase in corporate profits, as compared with the increase in wages and salaries, represent an unreasonable increase in profits?

b. Do you consider that these relationships indicate harmful trends in the economy?

7. Following the war, American industry as a whole expanded actively. Public utilities, like A. T. & T., electric power, and the railroads obtained funds for this expansion very largely from the sale of bonds and preferred stock and from bank loans. Some manufacturing corporations, like Standard Oil of New Jersey and U.S. Steel, were able to finance expansion with past and current profits to a large extent. Manufacturing corporations as a whole retained about two-thirds of current profits for investment in additional and improved facilities, where before the war only one-third of profits was retained for internal investment. Relatively little common stock was sold for this postwar expansion program:

a. What profit conditions made the utilities go to outside sources for investment funds when manufacturing corporations were able to finance expansion to a considerable extent with internal funds?

b. What are the advantages of internal financing to the individual corporation?

c. The Temporary National Economic Committee of the Federal government heard a large amount of testimony against the internal financing of industrial growth. This method of internal financing by large corporations was criticized because it was said to promote monopoly by enabling successful firms to grow larger and larger and more and more efficient. Do you agree that this method of financing growth is harmful to the economy?

8. In his Economic Report of January, 1949, President Truman wrote: "Profits [of corporations] in 1948 again surpassed all previous records and were rising through-

out the year. . . . As I pointed out a year ago, such profits are in excess of the levels needed to furnish incentives and equity funds for industrial expansion and to promote sustained economic health, although some businesses have not thrived nearly so well as others."

Do you agree or disagree with the President's opinion?

9. During the postwar years 1947–1949, there was considerable criticism of industry management by some public leaders because industrial managements increased prices sufficiently to earn profits at record levels. For example, in 1929 corporation profits (after Federal taxes) amounted to 8.4 billion dollars when gross national production had a market value of about 104 billion. In 1940, with gross national product of 100 billion, corporation profits (after tax) were 6.4 billion. But in 1947 with gross national product of 231 billion, corporation profits (after tax) reached the unprecedented total of 18 billion. In 1948 corporation profits were still higher: about 21 billion.
   a. Should managements have been satisfied with profits at the 1929 or 1940 levels?
   b. Would it have been better for the whole economy if profits had been smaller in 1947 and 1948 and wages and salaries correspondingly higher, as some labor leaders recommended?

10. Corporation A has a ratio of payroll to sales value of product of 20 per cent, and profits (after tax) of 15 per cent sales. Corporation B has a ratio of payroll to sales value of 60 per cent and profits (after tax) of 10 per cent of sales.
    a. With which corporation would you prefer employment as a factory worker, judging the desirability of employment only from the viewpoint of probable income?
    b. Which corporation could install the most satisfactory profit-sharing plan—that is, satisfactory to both top management and employees?

11. Before the Second World War a large corporation put a profit-sharing plan into effect that paid to employees a per cent of profits after taxes and after some per cent of net worth was subtracted as minimum return to stockholders on their capital investment. The employees' share of profits was distributed in proportion to each employee's annual earnings. During the years immediately before the war, the ratio of total payrolls to total sales value of product was 40 per cent. Profit (after Federal taxes) was 12 per cent on sales. During the war, ratio of payrolls to total sales value of product increased to 50 per cent (largely because of changes to war production and to reduction of sales value by renegotiation of government contracts and price reduction by government agencies). Ratio of profit (after taxes) to sales value declined to 3 per cent (largely because of renegotiation and much heavier taxation). The plan was abandoned during the Second World War.
    a. Can you suggest a reason for abandoning the plan based on the stated facts?
    b. While this plan was in effect, corporation sales declined due to a general decline in business activity, but in order to maintain employment, the corporation continued to produce goods at the old rate. Goods not sold went into finished-goods inventory. How did this practice tend to affect each employee's return from the profit-sharing plan?

c. At another period during the operation of the profit-sharing plan, the prices of steel, copper, and other raw materials increased considerably. In order to protect the assets of the corporation against loss if prices dropped suddenly, the corporation management decided to charge 2 million dollars against current operations, and to set this up as an "inventory reserve" out of which losses would be paid if and when incurred. This is considered conservative accounting practice. Three years later, when prices appeared to be stabilized at the high level, the management decided to discontinue the 2-million-dollar inventory reserve and to credit 2 million dollars to current income.

How will each of these accounting actions affect the employees' returns from the profit-sharing plan?

d. Do your answers to (*b*) and (*c*) indicate possible difficulties in the satisfactory operation of profit-sharing plans?

11. PRODUCTION PER MAN-HOUR

Production per man-hour is the measure of progress in the plane of living in a dynamic society. In an earlier chapter it was noted that the speed with which things can be produced determines the plane of living that can be supported by a nation. How much can be produced in a given time determines the wealth or poverty of the society. If production per man-hour is high, the economy enjoys a large annual average income per person; if production per worker is low, men women, and children are doomed to poverty, and as production per man-hour increases, the society reaches up to higher and higher levels of income and living standards.

High productivity—a high rate of production—is the most significant characteristic of American industry. The United States has developed the highest productivity that has been achieved by any nation. It is estimated that in the more normal prewar years the United States, with about 7 per cent of the world's population, produced 35 per cent of the world's goods. In 1948, with much of the world outside of the United States producing at a subnormal rate, the United States produced half of all the goods produced. High productivity is, in modern nations, what fertile land was in the first decades of the nineteenth century—the foundation of a prosperous, wealthy economy, and the road to economic progress and affluence.

Productivity and Progress. Total physical output that can be achieved in a given time by the national labor force is the result of three basic factors: the size of the employed working force, the average hours per week or per year the average force works, and the production (in physical units) per man-hour. Total output, in other words, depends on how many people work, how many hours each week they are willing to work (or are compelled to work), and how efficiently they can work—how fast they can turn man-hours into goods. This third factor includes all of the familiar factors that contribute to greater efficiency of production—a plentiful supply of accessible raw materials of good quality, low-cost transportation, ample capital resources, able and progressive management, an ample, energetic, skillful labor force.

Of these three factors only the third—production per man-hour—is susceptible to considerable increase, assuming the available labor force is fully employed. The size of the working force under usual conditions grows only as fast as the population grows. The length of the work week is more likely to decline than to increase except under conditions of emergency, as during the Second World War. But the productivity of American manufacturing industry has doubled in a generation and can double again under favorable conditions.

Assuming that full employment exists, then production per man-hour is the only large positive force tending to increase the *real* income and plane of living of the average person, and he can benefit only to the extent that increase in productivity overbalances the decline caused by any reduction in working hours that may take place.[1]

Production per man-hour is an important factor in major practical problems. As it is the foundation that supports real income, it is also the foundation under the national wage and salary structure. Increases in real wages come from increases in production per man-hour, and the reasonable expectation of future wage and salary increases is justified by the still larger increases in over-all production per man-hour that can be anticipated. Also, forecasts of national product or of national income require that an estimate be made of the future trend of production per man-hour.

The Distinction between Productivity of Industry and Productivity of Labor. In this discussion, productivity refers to the combined accomplishment of all the factors of production: natural resources, capital investment in equipment, management, and rank-and-file labor. All of these factors are necessary and are responsible for what happens to productivity of industry. It is impossible to segregate their individual contributions. However, it will be shown that increases in the productivity of industry depend primarily on the availability of more and more mechanical power and power-driven laborsaving machinery and equipment and of the money investment that makes these available. But poor planning and poor direction and supervision of labor by management can seriously reduce the potential benefits of larger investment per worker. Likewise, unskilled or noncooperative labor can seriously restrict output in even the best planned and equipped factory. All three factors of capital, management and labor are essential to maximum productivity, but neither management nor labor—no matter how skillful and willing—can achieve higher levels of productivity if the vital power and mechanical equipment are lacking. Productivity of American manufacturing industry has multiplied not because labor works harder. Actually, increased production per man-hour has been accompanied by less manual labor because of the mutiplied amount of mechanical power and equipment that has been made available to each worker.

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[1] "Real" income and "real" wages refer to income and wages measured in terms of physical goods or services instead of in dollars. It is income or wages measured in dollars of constant value.

Statistics of Productivity of Manufacturing. Accurate statistics of production per man-hour have been available only from fairly recent times, and even today are hard to come by. Even the most careful studies can produce only rough estimates. Measurement of productivity requires a knowledge of the number of workers employed, the average length of the work week and of the physical volume of production. The difficulties arise with this third factor and particularly with the measurement of output in physical units. The collection of physical output figures might not be too difficult for a single factory, but even this relatively simple task would involve difficult problems of measurement if the kind and quality of the product varied over the years. Imagine the problem in terms of a Ford or Chevrolet factory over a period of 20 or 30 years. How would you measure the output of Model T Fords in the same physical units as other contemporaneous automobiles? There is no easy way in which quality, performance, and service can be measured quantitatively. All the figures that purport to measure production per man-hour over a long term of years necessarily neglect the very considerable effects of changes in these intangible, but highly important, characteristics. The recorded performance of industry would be considerably better if quality and service could be taken into account.

The most careful and authoritative estimates of production per man-hour of American manufacturing have been made by Solomon Fabricant of the research staff of the National Bureau of Economic Research. The indexes of output used by Fabricant are indexes of physical output (in tons, units, gallons, etc.) based on U.S. Census data combined with suitable weighting. Where dollar output figures are used, they are converted to a constant price.[2]

The studies of productivity made by Fabricant covered a 40-year period from 1899 to 1939. Production per man-hour tripled during this 40-year period. This is an annual increase compounded (as with compound bank interest) of approximately 3 per cent.[3] Because of the importance and standing of Fabricant's work, it will be given detailed consideration.

[2] FABRICANT, SOLOMON, "Employment in Manufacturing, 1899–1939," National Bureau of Economic Research, Inc., New York, 1942.

[3] This geometric ratio or "compound interest" rate is a convenient way of measuring average increase per year for different periods of varying length. For long periods the annual average rate of change has been more nearly geometric than arithmetic, but for short periods and from year to year, the rate has been highly erratic (see Figs. 11 • 1 and 11 • 2).

During these 40 years employment of labor in manufacturing increased from about 5 million workers in 1899 to over 10 million in 1939, but at varying rates, largely because of the First World War. The peak of employment for the entire period occurred in 1919. Later peaks in 1929 and in 1937 did not reach the number of men employed in 1919, but at these later peaks total production and production per worker were larger.

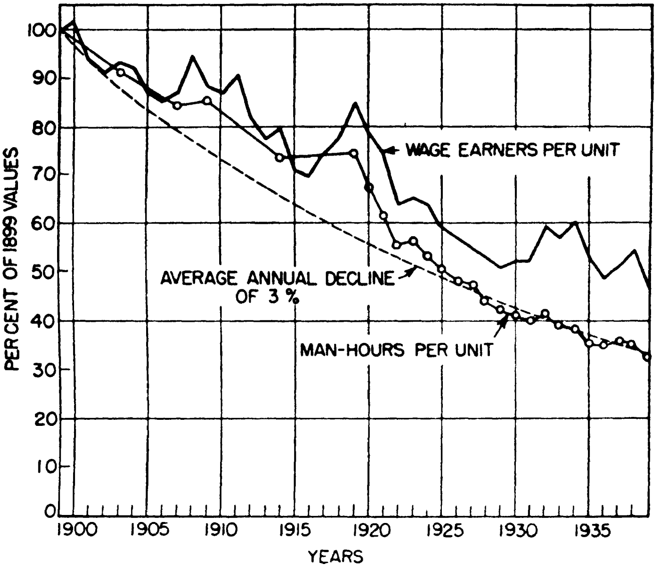

Fig. 11 • 1. Wage Earners and Man-hours per Unit of Product, 1899–1939

During the 40 years (1899–1939) the number of wage earners per unit of output in manufacturing decreased from 100 to 47; the man-hours per unit of output decreased from 100 to 32. These decreases were at a considerably lower rate during the first 20 years. The average annual rate over the 40 years was 3 per cent.

Factory output rose sharply between 1899 and 1937. By 1937 the physical product of our factories had increased 276 per cent (1899 = 100; 1937 = 376); the number of employees had increased only 100 per cent. Output, like employment, increased spasmodically, but the successive peaks were higher throughout the 40 years. Output nearly quadrupled, although employment doubled. Thus, output per worker nearly doubled, or there was a decline of nearly 50 per cent in the number of workers per unit of output.[4]

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[4] Unfortunately, Fabricant measured productivity by workers per unit of output or by man-hours per unit. It has become the more common practice to use the reciprocal: production per worker or production per man-hour. Except for references to Fabricant's work (and in Figs. 11 • 1 and 11 • 2) the more recent custom of using producton per man-hour will be followed. In Table 11 • 1 productivity is given in Fabricant's figures, and also (in the last column) as Output per Man-hour.

Up to this point productivity has been considered as the production per worker; that is, in units of workers instead of units of man-hours. Measurement of productivity in this way overlooks the effect of changing hours worked a day and week. It overlooks the significant reduction in hours per week that occurred during the period.

In 1899 the average full-time week for all manufacturing was about 60 hours, whereas in the years just before the Second World War the average work week was less than 40 hours, and 35 hours in some important industries. The average work week declined about 10 hours during the 30 years from 1899 to 1929, and then dropped another 10 hours in the next 10 years.

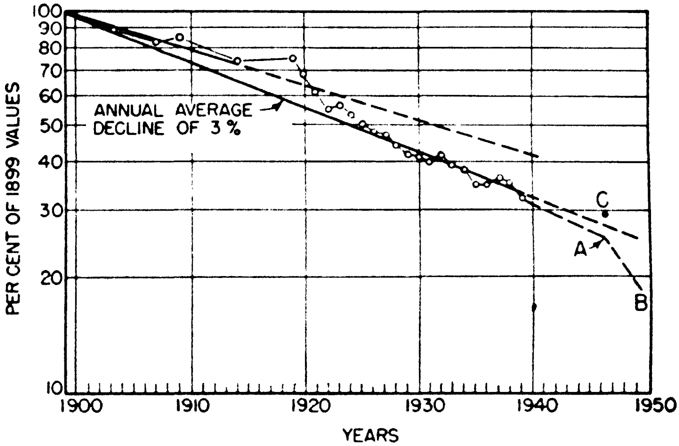

Fig. 11 • 2. Man-hours per Unit of Product, 1899–1939

This logarithmic chart shows by the straight lines the average annual rates of decrease in man-hours per unit of output during the first half of the 40-year period and during the entire period. The points *A*, *B*, and *C* are different estimates for 1950 made in 1944 and 1947.

During the 40 years covered by Fabricant's studies, manufacturing output nearly quadrupled, the number of workers doubled, and the average work week declined by one-third. The combined result is an increase of output per man-hour to three times the 1899 value. The figures for all years are given in Table 11 • 1.

Figures 11 • 1 and 11 • 2 show the over-all results of Fabricant's work and are based on the data of Table 11 • 1. Figure 11 • 1 shows that wage earners per unit of output declined to about one-half of the 1899 value; and that man-hours per unit declined to one-third of the 1899 value. Figure 11 • 2 shows the same man-hour figures plotted with a logarithmic vertical scale. The useful property of the log scale is that a constant geometric rate of decline (the annual average rate compounded) shows as a straight line.[5]

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[5] For comment on the use of log charts, see Chap. 2, footnote on p. 36.

Table 11·1. Productivity—All Manufacturing Industries—1899 = 100

Year	Output	Number wage earners	Wage earners per unit	Total man-hours	Man-hours per unit	Output per man-hour
1899	100	100	100	100	100	100
1900	102	104	101			
1901	115	109	94			
1902	129	118	91			
1903	132	122	93	120	91	110
1904	124	115	92			
1905	148	128	87			
1906	159	134	85			
1907	161	140	87	136	84	118
1908	133	124	94			
1909	158	139	88	134	85	118
1910	168	145	87			
1911	161	145	90			
1912	185	151	81			
1913	198	152	77			
1914	186	146	79	136	73	137
1915	218	153	70			
1916	259	179	69			
1917	257	191	74			
1918	254	195	77			
1919	222	188	84	164	74	135
1920	242	188	78	161	67	150
1921	194	144	74	119	61	163
1922	249	160	64	137	55	182
1923	280	183	65	158	56	177
1924	266	170	64	141	53	189
1925	298	175	59	148	50	201
1926	316	179	57	152	48	208
1927	317	175	55	148	47	214
1928	332	175	53	147	44	226
1929	364	187	51	156	42	233
1930	311	162	52	129	41	241
1931	262	137	52	104	40	252
1932	197	117	59	82	41	240
1933	228	129	57	89	39	256
1934	252	151	60	95	38	265
1935	301	160	53	107	35	281
1936	353	174	49	124	35	285
1937	376	191	51	134	36	281
1938	295	160	54	104	35	284
1939	374	176	47	121	32	309

Figure 11·2 indicates that the 40-year record should be divided into three different experiences. From 1899 to 1914 (before the First World War) there was a fairly steady improvement in productivity but at a low average rate that would have required 32 years to cut the man-hours per unit of output in half; this is equivalent to an average annual rate of approximately 2¼ per cent (compounded). During the 5 years of the First World War, man-hours per unit increased slightly; that is, productivity declined. And from 1922 to 1939, man-hours declined fairly steadily at a rate that would have cut the man-hours per unit in half in 24 years. This is equivalent to approximately 3 per cent annual average rate. It is apparent from Fig. 11·2 that the 1899–1914 rate of 2¼ per cent, if it had continued throughout the 40-year period, would have cut man-hours per unit to only 43 per cent of the 1899 value (instead of 32 per cent).

Productivity since 1939. It is important to know how productivity in manufacturing has changed since 1939, and particularly since the end of the Second World War. Rough checks have been made, and the Bureau of Labor Statistics has undertaken an industry-by-industry study of productivity, but there are no such authoritative figures available for the war and postwar years as the Fabricant studies for the period from 1899 to 1939. During the change-over of industry from civilian to military products in 1940–1942, man-hours per unit of product were undoubtedly increased. During the war years increased productivity (which was marked) applied to military goods only and was the result, to a considerable extent, of applying existing mass-production methods to war products. Civilian industries undoubtedly suffered reduced production per man-hour, as the Bureau of Labor Statistics studies are bringing out.[6]

A study made by the National Industrial Conference Board shows that output per man-hour (the reciprocal of man-hours per unit of output) had increased about 10 per cent by the end of 1946 (1939 = 100).[7] This is an annual average of about 1.5 per cent, one-half the annual rate of the previous 40 years.

A more optimistic opinion (as of 1944) was published in the *Economic Outlook* by the CIO:

> Output per man-hour in manufacturing as reconversion is completed will be at least 25 per cent above the 1939 level. Although the Bureau of Labor Statistics believes the normal rise in productivity has been slowed during the war in civilian industry because of shortages of materials and machines, it estimates that after the war, productivity in manufacturing industries will

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[6] "Trends in Man-Hours in Construction Machinery and in Machine Tools, 1939–1945." Both of these BLS studies show decided declines in output per man-hour.

[7] Productivity and Labor Trends, *Business Record,* May, 1947, published by the National Industrial Conference Board, Inc., New York.

increase at the rate of 10 per cent a year for three years after the first full year of reconversion.[8]

If these guesses cited by the CIO staff are combined, man-hours per unit of output in 1949 or 1950 would be down to 19 per cent of 1899, or production per man-hour would be better than five times that of the earlier year. This combined CIO estimate is indicated by the points *A* and *B* in Fig. 11·2. Point *C* is the estimate of the National Industrial Conference Board for 1946.

Table 11·2. Production per Man-hour—Selected Manufacturing Industries*

Industry	Period covered	Average annual increase, compounded
Cigarettes	1904–1939	5.9
Automobiles and parts	1899–1939	5.1
Glass	1899–1939	3.7
Petroleum refining	1879–1939	3.5
Beet sugar	1899–1939	3.5
Chemicals	1899–1939	3.4
Silk and rayon textiles	1879–1939	3.4
Locomotives	1889–1939	2.4
Cotton goods	1869–1939	1.4
Ships and boats	1899–1939	0.7

* Fabricant, Solomon, "Labor Savings in American Industry, 1899–1939," Occasional Paper 23, National Bureau of ch, Inc., New York, November, 1945.

Productivity of Different Industries. In considering over-all figures of productivity in manufacturing operations, it should be remembered that different industries, trades, and occupations offer widely differing opportunities for improvement. Productivity, it will be shown, is determined primarily by the intelligent use of mechanical power and laborsaving machines and tools. Consequently, productivity tends to be highest where the most complete mechanization is possible, and lowest in industries where hand labor is necessary. For example, cigars, which are still made by hand to a considerable extent, show an annual increase in production per man-hour of only 1 per cent over a period of 70 years; cigarettes made by machinery show an annual increase in production per man-hour of nearly 6 per cent over a period of 35 years. The list of selected manufacturing industries in Table 11·2, arranged in order of gains in production per man-hour, supports this point.

It should be noted that these figures show rate of gain in productivity within the single industry; these particular figures have no bearing on the relative efficiency of different industries. An industry that was highly efficient in the beginning year might show a low rate of gain, while an industry with low productivity in the earlier years might show a high rate of improvement and still be less efficient at the end of the period than the former industry.

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[8] *Economic Outlook*, November, 1944.

Some comparative figures of productivity (output per man-hour) for railroad transportation, mining, electric light and power—are shown in Table 11 · 3.

Table 11 · 3. Production per Man-hour—Selected Industries, 1939 = 100

Year	Manufacturing	Railroad transportation	Mining	Electric power
1909	38.1			
1914	44.2			
1915	. ....	......	48.6	
1917	...	54.2	48.5	43.1
1919	43.8	56.7	49.6	
1922	57.9	60.9	57.7	46.0
1925	65.0	68.2	62.6	50.4
1929	75 5	75.1	69 9	54.1
1933	82.9	83.0	78.8	68.1
1939	100.0	100 0	100.0	100.0
1945		139 5	117.8	181.4
Annual total increase, per cent	162	157	142	321
Average number of years	30	28	30	28
Average annual increase compounded, per cent	3 2	3½	3	5¼

In Table 11 · 3 the data for manufacturing are from the same source as the figures of Table 11 · 1, except that in Table 11 · 3 the base year is 1939 instead of 1899.

Productivity of Agriculture. If we look back to the early years of the nation, nearly 90 per cent of the working people was engaged in producing food and the raw materials for clothing for the whole population. In 1820 2 million out of a total labor force of about 2.9 million were in agricultural pursuits. Today less than 20 per cent of the working force is able to do the same job. This is a crude measure of the improvement in productivity of the American farmer. Measured more accurately, farm production per worker has increased 2.5 times since 1870 and harvested acres per worker have doubled.[9]

[9] Dewhurst, J. Frederic, and Associates, "America's Needs and Resources," pp. 621–623, The Twentieth Century Fund, Inc., New York, 1947.

The need for food is basic, and food production comes first in the economy of most nations; and, unless food is produced efficiently, there is little chance that a high standard of living can be realized. Except for a few special cases, such as New Zealand and Argentina, the part of a nation's labor force engaged in agriculture is an indication of the nation's plane of living. In the wealthy countries less than 25 per cent of the labor force usually is engaged in the primary occupations of farming, fishing, and lumbering; in the poorest countries from 50 to 80 per cent of the workers have to labor to feed and clothe themselves and the rest of the nation.

Productivity of farm labor, as with manufacturing, depends largely on the greater use of power-driven machinery. The gasoline-driven tractor, the combine, the corn picker, the cotton picker, and many other new tools have contributed to a material increase in output per man-hour. Man-hours of total labor for seven major farm crops (corn, wheat, oats, cotton, potatoes, milk, and hogs) were reduced 26 to 30 per cent from 1909–1913 to 1932–1936. This is equal to an average annual compound rate of 1.3 per cent to 1.5 per cent.[10]

According to Carl C. Taylor of the Department of Agriculture,[11] "14 per cent fewer workers produced 44 per cent more food and fiber in 1940–1943 than in 1910–1914." This is equal to an over-all increase of 67 per cent in output per worker and an average annual increase of 1¾ per cent compounded.[12]

Table 11·4 shows a range of figures of farm production per worker based on studies of the Bureau of Agricultural Economics of the Department of Agriculture.[13]

For both the entire period of 74 years and for a shorter period of 44 years, from 1900, the average annual increase in production per worker compounded is about 1¾ per cent.

Productivity in Distribution. More than half of the labor force is employed in the United States in the so-called service occupations. Except for public utility services of light, power, transportation, and communications, these are largely "hand-labor" occupations that provide little opportunity for increased mechanization and for increased productivity.

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[10] FABRICANT, SOLOMON, "Labor Savings in American Industry," 1899–1939, Occasional Paper 23, p. 7, National Bureau of Economic Research, Inc., New York, November, 1945.

[11] Carl C. Taylor of the Bureau of Agricultural Economics testifying before the Senate Committee on Post-war Economic Policy and Planning hearings, May 10, 1944, pp. 686 and 696.

[12] Daniel J. Ahearn, Jr., in his recent book: "The Wages of Farm and Factory Laborers, 1914–1944," gives the increase in "output per farmer and adult male worker" as 43 per cent in the 25 years from 1914 to 1939. This increase is equivalent to an annual rate of 1.5 per cent (p. 213, Table 50, Columbia University Press, New York, 1945).

[13] "America's Needs and Resources," Table 217, p. 622. The Twentieth Century Fund, Inc., New York, 1947.

"The volume of goods handled per worker in the field of distribution shows little change since 1870 in the face of—and probably partly because of—great increases in the average volume of goods produced per worker in production."[14]

The costs of retail distribution have been increasing (as a per cent of sales volume) as far back as there are records. Malcolm P. McNair[15] quotes the "History of Macy's of New York, 1858–1919," to show that the operating expense of a department store increased from about 14 per cent of sales in 1888 to nearly 24 per cent in 1919. Professor McNair estimates that during the 1930's the expense figure penetrated the 30 per cent bracket.[16]

Table 11·4. Agricultural Production per Worker, 1870–1944

Year	Index: 1940 = 100	Index: 1939 = 100
1870	39	41
1880	47	49
1890	51	53
1900	58	60
1910	63	66
1915	69	72
1920	78	81
1925	81	84
1930	85	89
1935	79	82
1939	96	100
1940	100	104
1944	129	134
Average annual increase compounded	. .	1¾ per cent

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[14] *Ibid.*, p. 552.

[15] *Harvard Business Review*, p. 338. Spring Number, 1945.

[16] Total expense figures for department stores reporting to the Harvard Bureau of Business Research were

Per cent of net sales	Year
39.5	1932
36.0	1937
34.3	1941
28.0	1944

"The 'Miracle' of Productivity," No. 9, p. 18, ***Studies in Business Economics***, National Industrial Conference Board, Inc., New York, June, 1947.

Mail-order houses, chain stores, cooperative selling, and supermarkets, along with cafeterias, have worked in the opposite direction to reduce distribution costs. But these developments operate to reduce service and convenience; not, as a rule, to give the same or more service for less labor.

Distribution costs as a per cent of sales will naturally rise if production costs and selling prices decline. If we assume an article has a selling price of $1 and a manufacturer's price of 70 cents, the 30-cent retail "markup" is 30 per cent of the sales price. If the same article is reduced by the manufacturer to 50 cents, the same markup of 30 cents amounts to 37.5 per cent of the selling price. But this per cent increase does not mean that the purchaser has been hurt. Marketing costs need be criticized only when they increase the sales price or when the services *desired by the customer* are reduced without a reduction in price.

The service convenience and pleasures of buying and the resulting marketing costs tend to increase with a rising standard of living. It was reported a number of years ago that the principal department store in Moscow had a "markup" of only 4 per cent. But the low standard of service that this low cost implies would scarcely satisfy an American clientele. Retail distribution costs during 1945 were probably at an 18-year minimum because many services and privileges were necessarily curtailed because of war conditions.

It is a sign of increasing national wealth when the labor force employed in the service industries increases. The costs of distribution represent not only the costs of creating new markets and increasing old markets, but the desire of the people for more convenience and better service. Since workers engaged in government service are included in the service category, the large increase in the number of persons on government payrolls is a factor that should be taken into account.

The simple fact that the per cent of the labor force engaged in service occupations has doubled since 1870 shows the growing importance of these auxiliary occupations and the services they render.

Average Productivity of the Entire Working Force. We can now combine the average figures of increase of productivity of the three major groups of the labor force to show the increase of productivity of the entire working force. Plainly this composite increase is much lower than the increase of the manufacturing group which is the group commonly considered, and which has the highest productivity. Table 11·5 shows this calculation.

This simple calculation shows that the productivity and the standard of living of the entire working force (and of the population) has been increasing at something under 2 per cent annually over the past 30 to 40 years. At an annual rate of 2 per cent, compounded, it takes 35 years to double average real incomes.

Fabricant estimates that for the American economy as a whole there was something like a doubling of the goods and services produced by a man-hour of labor during the 40 years 1899–1939. National product per capita rose about two-thirds.[17]

Fabricant at a meeting of the National Industrial Conference Board gave the annual increase in productivity of the entire working force as 1.9 per cent (compounded) covering the period of 40 years from 1899 to 1939.[18]

Table 11·5. Average Productivity of Total Labor Force, 1940

Occupational group	Millions of workers	Labor force, per cent*	Annual increase in productivity†	Weighted increase in productivity
Agriculture, forestry and fishing	8.9	18.5	1.75	0.32
Construction, mining, manufacturing, and mechanical industries	15.3	31.7	3.00	0.95
Public utilities	3.3	6.8	4.00	0.27
Trade, clerical, professional, government service, domestic and personal service	20.7	43.0	0.70‡	0.30
Totals	48.2	100.0		1.84

* 'America's Needs and Resources, Table, p. 547, The Twentieth [illegible] Fund, Inc., New York

† Taken from various tables in the text

‡ This figure is simply a guess, and the value used was taken so as to make the total agree reasonably well with Fabricant's estimate of 1.9 per cent

An annual rate of increase in productivity from 1.8 per cent to 2 per cent continued for such a long term as 40 years is no small achievement. But it also emphasizes the small margin of safety if there should be any decrease in the accumulation of capital and in the progress of mechanization on which productivity so greatly depends.

The important part played by the mining, manufacturing, and other mechanized industries in the over-all picture is apparent. Approximately one-half of the over-all increase is due to this 32 per cent of the working force. These mechanized industries must continue to carry most of the burden if the private enterprise system is to continue the trends toward shorter working lives (between the end of schooling and the beginning of retirement), shorter working hours per week, more conveniences and luxuries offered by the service industries, more generous provisions for social security, and the major objective of higher real incomes. All of these desirable social objectives depend basically on higher and higher rates of production.

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[17] FABRICANT, SOLOMON, *op. cit.*, pp. 39–40.

[18] "The 'Miracle' of Productivity," *Studies in Business Economics*, Number 9, p. 6, National Industrial Conference Board, Inc., New York, June, 1947.

Productivity of Different Countries. It is generally agreed among economists who have studied productivity statistics that these figures for United States productivity of over-all industry have not been exceeded in any other country.

Dr. Leon Rostas, in an article in the April, 1943, *Economic Journal* of Great Britain, supports this opinion. He states, concerning conditions in 1937:

"Industrial efficiency, as measured by production per head, was roughly similar in Great Britain and Germany, while in the United States it was more than twice as great as in the other two countries."

The Economist in its series of articles, A Policy for Wealth, quoted Dr. Rostas and added:

> In 1943, when there was full employment in both countries, the output of wealth per head of the population was from 1.75 to 2.5 times as large in America as in Britain (the exact ratio depending on the figure assumed as a fair purchasing power parity between the two currencies), and this in spite of the fact that a much higher proportion of the American labor force is in agriculture with its below average productivity and despite the shorter working hours in the richer country.[19]

The Sources of Increased Productivity. The record of American industry in increasing production per man-hour has been called a "miracle of productivity," but it is actually no miracle. A steady increase in productivity may appear to be a natural and inherent quality of American industry; something that will continue in spite of any changes in the institutions of American society, in the incentives to work and to save, in the availability of money capital or in the skill, energy, and imagination of management. Increase in production per man-hour is not generated automatically nor does it come about by natural law.

On the contrary, the increase in productivity of American industry is the result of hard work, skill, and the favorable conditions of our institutions. It is closely related to the effective incentives of the American economic system. To the engineer and factory manager, increase in productivity is a program to be renewed, revised, and extended year after year. Increased productivity is the result of long-range planning and capital investment. It is one of the engines of progress whose strength should be carefully and deliberately developed by public policy.

An elementary example of how production per man-hour can be increased was given in an earlier chapter in the description of the model of a dynamic society—the weaver-shoemaker model.[20] The weavers were able to double their output each week because one of their number invented and developed an improved loom and the entire group of weavers were willing

[19] *The Economist*, London, Aug. 19, 1944.

[20] Refer to Chap. 7, p. 133*ff*.

to invest their spare time to develop and construct the improved looms. The weavers worked no harder and no longer with the improved equipment, yet produced twice as much cloth per week. Improved tools is one answer to the question.

A more general answer can be obtained from the actual experience of the bituminous coal-mining industry in the United States. During the 10 years between 1936 and 1946 bituminous coal production increased from 439 million tons a year to 530 million tons. But the number of miners employed *declined* from 477,000 to 405,000. Hours worked per week increased, partially offsetting the decline in the labor force, but, over-all, man-hours per ton dropped from about 1.5 in 1936 to about 1.1 in 1946. Output per man-day increased from 4.5 tons in 1936 to 5.8 tons in 1946, or an increase just under 30 per cent in 10 years.[21]

What were the specific causes of this very considerable increase in over-all productivity? There were three major reasons, all associated with increased use of mechanical power and with improved methods and equipment:

1. The biggest factor in increased productivity was the increased use of a different and more efficient method of mining coal—strip mining contrasted with deep-pit or underground working. The number of strip mines increased from 381 to 1,432; total production from strip mines increased from 28 million tons to 106 million tons, or from 6.4 per cent of total coal mined to 20.6 per cent.
2. Mechanically loaded coal increased from 16 per cent to 58 per cent of total production.
3. Mechanically cleaned coal increased from 14 per cent to 26 per cent.

As a factor in all of these improvements, over-all electric-power consumption in bituminous coal mining increased about 70 per cent. Power consumption per ton increased from 7.4 kilowatt-hours to 10.4 kilowatt-hours, or 40 per cent. The corresponding increase in coal mined per man-day, it will be remembered, was just under 30 per cent. This is a significant correlation—more power used per ton means more tons mined per man-day.

This example is typical of conditions throughout American industry. Productivity has increased very largely because of the increased use of mechanical power and laborsaving machinery and the development of radically improved production methods, substituting machine methods for hand methods.

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[21] By contrast, 780,000 British coal miners produced about 225,000 tons of coal in 1938. In fairness, the deeper workings and shallower seams of coal in British mines should be considered. But mechanization in British mines has been hampered not only by these physical limitations, but by shortsighted policies of owners, managements, and trade-unions alike. The Reid Report, made by an official British committee, stated that in the United States there is one haulage worker for every 50 tons of coal produced; in Holland one for every 20 to 25 tons; and in Britain one for only every 5 tons. The report comments, repeatedly, "Efficiency is capable of improvement . . . the standard is too low" (from a review of the Reid Report in *The Economist*, London, Apr. 7, 1945).

The Growth of Mechanical Power. Back of this record of increased productivity is the phenomenal increase in the use of mechanical power in United States industry. A recent study of American economic development and resources provides an interesting picture of this increase in the use of power in industry over the past century, and the close connection between these developments and the high standard of living of the American people.

> Within the past century we have achieved almost a five-fold increase in net output per man-hour. The net output of our economy in 1944 was 27 times as large as in 1850 (both in terms of 1944 prices)—161 billion dollars compared with 6 billion dollars. Yet our labor force at the peak of the war effort was less than nine times as large as in 1850, and the total input of human labor, measured in man-hours worked, dropped down to less than six times the 1850 total because of the decrease in hours worked per week.[22]

How did this great increase in production per worker—this increase in human efficiency—come about? Quite clearly, it did not result in any major way from the ability of the average man to produce more things with less of his own energy. It could happen only because each worker had more and more mechanical power at his command to work for him.

The story of the power sources that have been made available to American workers over the past century provides a fascinating picture of our dynamic American economy and an illuminating explanation of why it has been able to accomplish so much.

Dewhurst and his associates made a rough estimate of "work-energy output" available from human workers, work animals, and mechanical power over the past century. These figures for selected years are given in Table 11 • 6.

These figures are only rough guesses, but they are sufficiently accurate to show the vast increase in the mechanical power that industry has put to service of society, and the complete reversal of the position of mechanical power and animal power in the American economy. Animal power reached its peak during the decade of the First World War and mechanization of armies began during that period. Within a generation mechanical power in its several forms has taken over the job and has vastly increased its size. In spite of a growing population, the energy output of human workers has held about the same since 1910, except for the spurt of the Second World War.

It was stated that production per man-hour increased nearly fivefold from 1850 to 1944—from 23 cents' worth per man-hour in 1850 to nearly $1.05 in 1944 (both in 1944 prices). But over the same period we used 343 times as much mechanical energy! However, all of this power was not used for production. A large part has been used for personal transportation (automobiles) and for household purposes.

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[22] DEWHURST, J. FREDERIC, and Associates, *op. cit.*, p. 680. Compare these estimates with estimates of real wages (1850–1940) in Table 12 • 2, Chap, 12, p. 258. This study was referred to in Chap. 2, Table 2 • 6, p. 34.

During this period the energy of work animals increased only 22 per cent, and the energy output of human labor increased less than six times (somewhat less than the increase in population). It is easy to see that the increased production per worker came from that part of the increase in mechanical power used in industry.

Table 11·6. Work Energy Output from Different Sources,* 1850–1944

Year	Billions of horsepower hours output per year				Percentage distribution		
	Mechanical sources	Work animals	Human workers	Total	Mechanical sources	Work animals	Human workers
1850	1.0	13.9	2.7	17.6	5.8	78.8	15.4
1860	1.6	20.0	3.6	25.2	6.5	79.2	14.3
1870	3.2	20.3	4.3	27.8	11.5	73.1	15.4
1880	6.8	27.4	5.7	39.9	17.2	68.6	14.2
1890	16.8	36.9	7.4	61.1	27.5	60.5	12.0
1900	31.3	42.9	8.7	82.9	37.8	51.7	10.5
1910	74.8	45.6	11.0	131.4	56.9	34.7	8.4
1920	145.0	41.1	11.3	197.4	73.5	20.8	5.7
1930	199.5	27.8	11.0	238.3	83.7	11.7	4.6
1940	260.4	18.5	10.5	289.4	90.0	6.4	3.6
1944	342.7	17.0	15.3	375.0	91.4	4.5	4.1

* "America's Needs and Resources," Appendix 32, Table B, p. 787, The Twentieth Century Fund, Inc., New York, 1947

The skill and effort of individual workers play a relatively small part in the total changes in output per man hour that have been achieved over the past century. Nevertheless, skill, effort, and cooperation of the individual are important, even if they do not set the ceiling of possible productivity. Lack of worker cooperation or skill can destroy or decrease the results of good equipment, good factory organization, and ample power, but in no possible way can the quality of labor be substituted for these mechanical aids. The best skilled craftsmen of the past were, at least, the equal of the best tool makers of today. With the best of good will, a single pair of hands, unaided by mechanical power, is no more productive today than a single pair of hands was 100 years ago.

The Relation between Mechanical Power and Productivity. Throughout this discussion of productivity the close relationship between the use of mechanical power and productivity in manufacturing has been stressed. Can this relationship be measured statistically? Taking 1899 as 100, Fabricant's figure for output per man-hour in manufacturing is 309 for 1939 (see Table 11·1). U.S. Census data on installed horsepower per wage earner in manufacturing show corresponding relatives for horsepower per wage earner at 292 in 1939 when 1899 is 100. Using the terminal years of this 40-year period, installed horsepower per wage earner increased 95 per cent as much as did output per man-hour.

The figures for these and the intervening years are shown in Table 11 • 7 and Fig. 11 • 3. The diagonal dash line indicates an exact 1:1 relationship; the steeper slope of the actual line between 1919 and 1939 indicates that other factors than horsepower per wage earner were also operating, but the over-all relationship is still striking. For eight different combinations of terminal years, the median ratio of the increase in horsepower per wage earner to the increase in output per man-hour is 80 per cent.

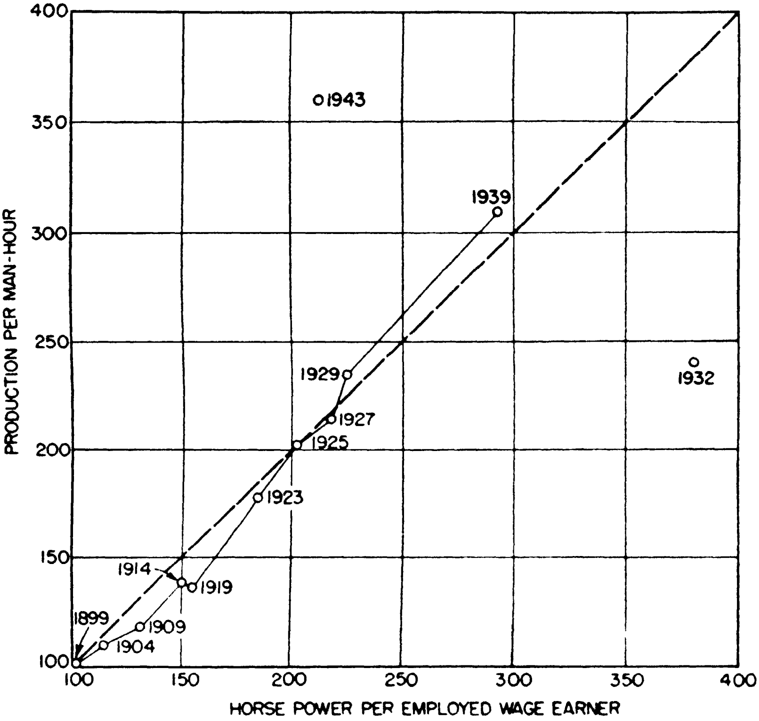

Fig. 11 • 3. Relation of Productivity to Horsepower in Manufacturing, 1899 = 100
Horsepower employed per wage earner and production per man-hour increased since 1899 at about the same rate. Statistics therefore confirm the logical relationship between these two factors. The data for 1932 and 1943 do not line up with other years because "horsepower installed" was not used at a normal rate—less in 1932, more in 1943.

One weakness of the available data is illustrated by the two separate points shown in Fig. 11 • 3 for 1932 and 1943. These two years apparently show an exactly opposite relationship—that higher production per man-hour goes with less horsepower per worker. The reason, of course, is that in 1932 the horsepower *installed* was not actually *used,* because of unemployment and short hours, while in 1942 the installed horsepower was used many more hours per day and week than in more normal peacetime years. With the limited data that are available, only those years of reasonably normal employment and hours of use are significant.[23] It should be recognized that in this chart "horsepower per employed wage earner" really stands for mechanization in all its aspects—for power-driven machinery and the effective use of mechanization in factory layout, in manufacturing methods, and in all matters that determine the effective use of mechanical power. The record seems to say that mechanical power has been used more effectively since 1919 than it was used before 1919.

Table 11·7. Production per Man-hour and Horsepower per Wage Earner in Manufacturing—1899–1939*

Year	Production per man-hour 1899 = 100	Wage earners, thousands	Installed horsepower, thousands	Horsepower per wage earner	
				Horse-power	Relatives 1899 = 100
1899	100	4,502	9,811	2.2	100
1904	110	5,182	13,032	2.5	115
1909	118	6,262	18,063	2.9	132
1914	137	6,476	21,565	3.3	150
1919	135	8,424	28,398	3.4	154
1923	177	8,194	33,092	4.0	184
1925	201	7,871	34,359	4.4	201
1927	214	7,848	37,126	4.7	216
1929	233	8,370	41,122	4.9	224
1939	309	7,887	50,452	6.4	292

* Sources: Production per man-hour: "Employment in Manufacturing, 1899–1939 by S. Fabricant, National Bureau of Economic Research, Inc., New York, 1942. (Also shown in Table 11·1, p. 222, last column).

Installed Horsepower in Manufacturing: *U.S. Census of Manufactures.* For noncensus years a calculated estimate is based on the Department of Commerce series "Expenditures for New Manufacturing Equipment."

The implications of this relation between productivity and horsepower per worker are far-reaching. The curse of poverty in the world can be removed only by major increases in productivity; productivity can be increased only as much as the effective use of mechanical power is increased. In a notable series of articles published by *The Economist* of London—A Policy for Wealth—the editor of this influential journal hopefully proposed that Great Britain adopt a policy and a slogan: "Double the production per man-hour within a generation."[24]

During the later years of the Second World War large gains in productivity were predicted by optimistic labor and government leaders as soon as

[23] Based on Applications and Problems of Productivity Data, by Charles E. Young, *Journal of the American Statistical Association,* p. 421, December, 1946.

[24] *The Economist,* London, Aug. 19, 1944–Oct. 14, 1944.

the lessons of war production could be applied to the manufacture of civilian products. A sobering fact is that for every gain in productivity there must be nearly the same gain in installed horsepower per worker. Installed horsepower per employed worker did not increase during the war years; increased production was obtained largely by using the available equipment more hours per day and per week, and by employing a larger working force. If production per man-hour is to be doubled here or in Great Britain, the installed horsepower per worker (and all the capital investment for mechanization that goes with it) must be doubled also.

Horsepower per Worker in Different Countries. If the use of mechanical power is so closely related to productivity (as Fig. 11 • 3 indicates), we should be able to find some confirming evidence in the use of mechanical power in other countries and the relation of this use of mechanical power to the country's average productivity.

Table 11·8. Use of Mechanical Power in Different Countries

Country	Horsepower per worker	Real wages
United States	100.0	100.0
Great Britain......	52.7	52.6
Germany	53.7	38.4
Italy	44.0	20.5

The International Labor Office of the League of Nations compiled, as of 1931, the relative use of mechanical power and real wages in four countries as shown in Table 11 • 8.[25]

We shall show in the next chapter the close relation that exists between increases in productivity and increases in real wages. At this point it will be necessary to assume that the relation between the use of mechanical power and real wages is approximately the same as the relation beween mechanical power and production per man-hour. The lower real wages in Germany and Italy in relation to horsepower per worker might be accounted for by less effective use of mechanical power in factory operations in those countries.

Professor T. T. Read of Columbia University has compiled figures showing the total available energy from coal, water power, and petroleum in a number of countries, and from his data the figures of Table 11 • 9 have been calculated.

These figures of daily horsepower-hours per capita for the United States, Great Britain, and prewar Germany agree roughly with Rostas's estimate of the relative productivities of manufacturing in these three countries, which were 2, 1, and 1, respectively. It can also be estimated (on the basis of incomplete and doubtful statistics) that productivity of manufacturing in U.S.S.R. in 1939 was roughly one-sixth of that of the United States.[26]

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[25] SNYDER, CARL, "Capitalism, The Creator," Chart XXIX, p. 259, The Macmillan Company, New York, 1940.

In an address at the Massachusetts Institute of Technology in June, 1948, R. T. Haslam, vice president of the Standard Oil Company of New Jersey, cited these interesting and significant figures:

The United States with about 7 per cent of the world's population uses 45 per cent of all the fuel used annually in the world. The people of the world, outside of the United States, use only one-tenth as much fuel energy per capita as do the people within the United States, and Asia, Oceania, and Africa (not including the northern African countries), with about 60 per cent of the world's population, use only 3 per cent of the United States per capita consumption.[27]

Table 11·9. Work Energy of Mechanical Power Available in Several Countries for the Year 1939*

Country	Millions of horsepower-hours per day	Population, millions	Daily horsepower-hours per capita
United States	1,568	131.4	11.9
Great Britain	353	46.2	7 6
Germany†	609	113.1	5.4
France	169	42.4	4.0
Italy	81	44.0	1 8
U S S R.	320	170 5	1 9

* Read, T I., World's Output of Work, *American Economic Review*, p 143, March,1945 These estimates are based on total production of coal and petroleum and on the estimates of the U S Geological Survey for potential water-power resources Professor Read has credited each country with the same relative development of its potential water-power resources as the actual development of U S resources, which is probably favorable to other countries, and especially to U S.S R.

† Includes Austria, Czechoslovakia, and two third of Poland

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[26] The following figures were published by the Committee for Constitutional Government of New York, of which Dr. Willford I. King, Professor of Economics, New York University, is president:

Country	Pounds of bread 1 hour of labor could buy "before the war"	Index United States = 100
United States	7 5	100
Great Britain	5 2	70
France	5 0	67
Belgium	4 9	65
Italy	2 8	37
Germany	2.5	33
U.S S R.	1.9	25

[27] Quoted from "World Energy and World Peace," published by Standard Oil Company of New Jersey, 1949.

Those who speak casually of feeding the world or clothing the world or of equalizing incomes and living standards throughout the world should ponder the implications of these relative estimates of the resources of mechanical power even in the more highly industrialized countries. The realization of a high standard of living requires an immense physical equipment for manufacturing and for farming. Each worker in a high-productivity economy requires his own considerable quota of mechanical power and of power-driven machinery.

The Need for Capital Accumulation. One more deduction can be drawn from these relationships. If a high plane of living requires the mechanization of production, a high plane of living requires a correspondingly high store of accumulated capital that only a highly productive economy can produce. A highly productive industry creates wealth, and wealth applied to production creates a still more productive industry.

There is thus an obvious connection between increase of productivity through mechanization and the need for larger and larger investment of capital per worker. A high and advancing level of productivity depends on keeping up and increasing the rate of capital formation.

Capital investment per wage worker in the United States increased more than 11 times during the 80 years from 1849 to 1929, as shown by the figures of Table 11·10. Comparisons between capital investment and current production are complicated by the different price levels that apply to past investment goods and to current production. Also, production per worker has been decreased by shorter working hours. Nevertheless, the steady increase in annual production per worker as investment per worker grows is significant. Both shorter working hours and higher average income per person have come from increased investment per worker. These social dividends do not come, over the long term, from government edict or from labor-union strength.

Opportunities for Progress in the Future. In spite of its advanced position among the industrial nations and in spite of its high productivity, there is no reason to believe that American industry has reached such a high level of efficiency that future progress need be either slower or more difficult.

We are a long way from perfection in any of our industrial processes, in the organization of industry, and most clearly, in those human relations involved in the cooperative efforts of management and workers. No machine operates without loss of energy, and human organizations operate under the handicap of much more serious frictions. Social and economic institutions are undoubtedly much less perfect than machines and subject to even greater losses and more subtle inefficiencies. Some idea of the size of these opportunities for further improvement in our economic machine may be gained from the analogous opportunities that exist in the engineering field. Suppose we take a quick look at how efficiently—or how inefficiently—some of our really successful machines are doing their jobs.

The average steam-electric power station of 1920 had an over-all thermal and mechanical efficiency of only 9 per cent; that is, only 9 per cent of the energy in the coal or oil reached the outgoing transmission lines. By 1940 this efficiency of 9 per cent had been doubled to 18 per cent. The best modern steam-electric stations have an efficiency of about 25 per cent. The large steam turbines of 50,000 to 150,000 kilowatt power, that drive the electrical generators in large central stations, have an efficiency rarely higher than 30 per cent, and this is the result of 50 years of intensive scientific research and engineering development, with all the advantages of accurate laboratory, factory, and field testing.

Table 11·10. Capital Investment per Wage Worker*

Year	Capital per wage worker		Gross annual product per worker	
	Dollars	1849 = 100	Dollars	1849 = 100
1849	$ 557	100	$1,065	100
1859	769	138	1,436	135
1869	825	148	1,646	154
1879	1,021	183	1,970	185
1889	1,532	276	2,200	206
1899	1,880	338	2,435	229
1909	2,790	501	3,130	294
1919	4,885	877	6,850	643
1929	6,152	1,152	8,120	762

*Sources of data U.S. *Census of Manufactures* and U.S. *Statistics of Incomes of Corporations*. Capital per wage worker includes total fixed and circulating net capital. Similar statistics are given by Carl Snyder in *Capitalism the Creator*, Chart XXVII, p. 237. The Macmillan Company, New York, 1940.

The most economical steam railroad locomotives of the usual reciprocating-engine type have an efficiency of not over 10 per cent.

The familiar 100-watt incandescent lamp transforms only 3 per cent of the electrical energy into visible light. In the newer and more efficient fluorescent lamp, now being used in commercial and industrial installations, the energy efficiency is still only 9 per cent.

It would be an optimistic and uncritical person who would rate the efficiency of American industry, in spite of its top position, above the efficiency of these mechanical devices. This is no cause for apology; instead, it should be a challenge and a reason for confident expectation of future progress.

Progress will come out of new discoveries by the scientists; out of new inventions, new products, and new industries by the engineers; from the development of new materials, more efficient power sources, new machine tools and manufacturing methods; new farming equipment and methods, better seeds and new crops, and more effective organization and management techniques. But this justified optimism concerning the future should be tempered by the realization that the slender margin of some 2 per cent annual increase in productivity can be easily reversed if the trend of political, social, and economic conditions is unfavorable to individual initiative and capital accumulation and investment.

Summary

Productivity is the measure of progress in a dynamic society. If productivity or production per man-hour is high, the economy enjoys a large annual average income per person; if productivity is low, the society is doomed to poverty. How well a society can live depends on how fast man-hours can be turned into goods.

Productivity is the only factor that can considerably increase the average man's real income. Total production depends on three factors: the size of the employed labor force, the hours worked per week, and production per man-hour. More working hours per week would increase total production and average incomes, but hours per week are more likely to decline than to increase. The size of the labor force increases only as population increases. But production per man-hour has doubled in the past and can double again.

Studies of productivity of manufacturing show that production per man-hour has been multiplied by three within the 40 years from 1899 to 1939. This is an average annual rate (compounded) of about 3 per cent. There was only one-half of this annual increase between 1939 and 1946.

The rate of increase in productivity has varied greatly in different industries. Those industries adapted to mechanization have enjoyed the highest rates. Hand industries have achieved little increase.

Productivity has also increased markedly in agriculture, though at a lower rate than in manufacturing. The average annual rate (compounded) from 1870 to 1944 was 1¾ per cent.

Productivity in the third major division of industry—in distribution of goods and in the service industries—has shown little change during the past 80 years except in power generation and transportation. Costs of retail distribution have been increasing.

Average annual productivity of the entire labor force increased at an average annual rate of 1.8 to 1.9 per cent over the 40 years 1899–1939.

Production per man-hour in the United States is about double the productivity of its closest industrial competitors.

The significant increase in production per man-hour in the United States has been the result principally of the increased use of mechanical power and of laborsaving machines and the development of radically improved production methods.

The great increase in the output of American industry per man has been possible principally because the average worker has had more and more mechanical power at his command to work for him.

Although work energy of human workers has increased only at the rate of population growth, and the energy of work animals was actually less in 1944 than in 1860, the work energy of mechanical power for all uses increased 342 times from 1850 to 1944. It is on this prodigious use of mechanical power that the productivity of American industry rests. The record shows that since 1899 the increase in production per man-hour in manufacturing has closely paralleled the increase in horsepower per employed wage earner (see Fig. 11 · 3).

Paralleling the relative productivities of different countries is the use of mechanical power. The United States, Great Britain, and Germany (as of 1931) ranked in use of mechanical power in about the same order as their respective productivities.

Because production per man-hour is so dependent on the use of mechanical power and power-driven machinery, and because these represent a large part of the capital investment of the manufacturing and farming industries, a high productivity and a prosperous economy depend on the accumulation and employment of large stocks of capital goods.

Capital investment per wage worker in the United States increased more than 11 times—from $557 to $6,152 from 1849 to 1929. Production per worker, despite the decrease in working hours, increased 7.6 times. Both shorter working hours and larger average incomes have come from increased investment per worker—not by government edict nor by labor-union pressures.

In spite of its advanced position there is no reason to fear that American industry has reached the limits of its possibilities. Progress will come out of new discoveries by the scientists; out of new inventions, new products, and new industries by the engineers; out of the development of new materials, more efficient power sources, new machine tools and manufacturing methods, new farming equipment and methods, and better seeds and new crops. But these favorable prospects can be realized only if conditions remain favorable to individual initiative and capital accumulation and investment.

Review Questions

1. *a.* In what major ways can each of the following factors of production increase the production per man-hour of the American economy?
   (1) Research by physicists and chemists.
   (2) Engineers engaged in the design of products.

   (3) Engineers engaged in the design of factory equipment.
   (4) Selling and advertising of new products.
   (5) Workers on machines and at benches in the factory.
   (6) Top management of corporations.
   (7) Owners of a business not taking part in management.
   (8) Federal government agencies.
   (9) CIO and AFL labor unions.

b. What generalization concerning productivity of industry can you deduce from your answers to *a*?

2. In 1931 a leading American manufacturer of electric-welding equipment required the use of 22 man-hours of direct labor for each ton of coated welding rod. In 1942 this figure had been reduced to 2.4 man-hours. What compound annual rate of increase in production per man-hour do these figures give?

3. What kinds of information would you need to obtain if you were assigned the study of over-all production per man-hour in three automobile factories: one producing Chevrolets; one producing Buicks; and one producing 5-ton trucks?

4. *a.* In each of the following pairs of industries, in which operation would you expect production per man-hour to be largest:
   (1) Wheat farming in the Middle West or in New England?
   (2) Setting type for a popular novel or for a mathematics textbook?
   (3) The manufacture of standard machine tools or factory jigs and fixtures?

   b. What principle is illustrated by your answers to *a*?

5. *a.* In what relative proportions would you expect to find the populations of the following countries engaged in farming, manufacturing, and the service industries: United States, Canada, Soviet Russia, India, China?

   b. How is this distribution of the population related to productivity of over-all industry in the several countries?

6. Assume the following conditions:

	1940	1960
Number of wage earners engaged in manufacturing, millions	8.5	10
Production per man-hour, per cent	100	200
Average horsepower of mechanical power available per wage earner	7	
Average amount of capital investment per wage earner	$6,000	

   a. If it is estimated that production per man-hour will double from 1940 to 1960, what would you estimate the 1960 figures for average horsepower per wage earner and average capital investment per wage earner would be? Explain the basis of your estimates.

b. What do you estimate total horsepower available for use and total capital invested in manufacturing will amount to in 1960?

c. What important deductions can you make from your estimated figures?

7. During the war estimates of postwar production per man-hour in manufacturing were made to the effect that by 1950 production per man-hour would be 170 per cent of the 1939 figure. Do you think this was a reasonable estimate? Give your reasons.

8. During the depression years of the 1930's there developed an opinion among an influential group of economists that the American economy had slowed down in rate of growth to such a degree that private business could no longer provide investment opportunities in an amount that would provide full employment for a growing population. At the same time, these "secular stagnationists" believed that American scientists and engineers would be more productive than ever and would advance technology, over the long-term future, at an even faster rate than over the past 20 or 30 years. In this connection Professor Alvin H. Hansen, one of the chief supporters of the stagnation thesis, wrote:

   > "Technological innovation may still bring about a very large increase in efficiency even though manufacturing is not absorbing any appreciable amount of new capital. . . . Improved equipment, financed mainly out of depreciation allowances, will continue to raise the per-capita output."[28]

   Do you believe that these two opinions—continued progress without adequate new investment opportunities—are consistent or inconsistent?

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[28] Reprinted from "Full Recovery or Stagnation" by Alvin H. Hansen, by permission of W. W. Norton & Company, New York. Copyright, 1938, by the publishers.

12 THE BEHAVIOR OF WAGES

According to static theory, the wage level is determined by the conditions of supply and demand and by the value of the marginal product produced by the last unit of labor employed, all under the conditions of perfect competition. In the static model it is decreasing marginal product and increasing marginal cost that is the effective leveling force that brings a labor market into equilibrium when all available labor is employed at wages equal to the value of the final competitive marginal product.

Under the dynamic conditions of actual industry, no such simple, unqualified explanation of the wage level is possible. The principle of supply and demand is effective in some degree, but only in the unskilled occupations or in the extremes of boom or depression. The marginal analysis, which depends for its validity on the principle of short-term diminishing returns, is difficult to apply to the dynamic economy of long-term increasing returns and decreasing costs. It is only necessary to recall the elevenfold increase in capital investment per worker that has occurred in American industry over the past century, and the accompanying increase in output per worker, to realize the basic difference between the conditions of static theory and actual industry.

Notwithstanding the complexities of the dynamic society, there are some general principles that underlie the behavior of wages in actual industry. As has just been indicated, the law of supply and demand operates to control wages to some extent and under certain conditions. The relative scarcity of labor and ample opportunities for self-employment had much to do with the high wage level in the beginnings of American industry. The long-term wage level of a country is determined, among other factors, by the *principle of substitution,*[1] and by the common-sense principle that no factor of production can be paid more than it produces unless it is at the expense of some other factor. All of the factors together can receive no more than the total market value of production.

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[1] According to the principle of substitution, entrepreneurs substitute low-cost factors for higher cost factors whenever possible. If wage rates are high, more laborsaving machines are used; if labor is plentiful and capital is scarce, manual labor is used in preference to machinery. In China, land is cultivated intensively because labor is plentiful and fertile land per person is scarce, and land is cultivated extensively in the United States where labor is relatively scarce and land is more plentiful.

There are many reasons, on the other hand, why the behavior of wages in the actual labor market does not follow completely the behavior that static theory indicates. One reason is that labor is not fluid. The mobility or transfer of labor is restricted. Transfers from one region to another region are difficult and costly; transfers from one trade to another are still more difficult; and transfers from one profession to another are virtually impossible.

Static theory fails to take into account the time, cost, and trouble involved in the actual transfer of men to new jobs. The time and trouble factor is minimized under perfect competition by the comforting observation that any change, however slow, is a change to a new *permanent* condition of equilibrium. The cost of adjustments during the transition can be spread over an indefinite time. But in the dynamic society change is continuous—equilibrium is never actually reached—and the costs of transferring labor from one job to another are incurred continuously, and the confusion caused by time lags and mistakes of foresight have much more serious consequences.

Another reason is that the forces tending to produce a static equilibrium in actual markets are for the most part weak and slow to act. In progressive industry, where conditions are continually changing, these leveling forces have neither the time nor the strength to do even a small part of the leveling job that theory assigns to them.

In yet another way the application of static marginal theory to actual markets is difficult. Land, labor, and capital do not work independently in the production process. Usually one factor cannot be varied independently and without making corresponding changes in other factors, as static theory assumes. If more men are employed, the necessary floor space (land) and equipment (capital) also must be provided. In actual industry if one machine operator can handle four automatic screw machines, the employer does not willingly provide one operator for each machine. And if more operators are employed, more machine tools are usually necessary. That important characteristic of capitalistic production—fixed or overhead costs—also complicates the situation. Static theory sees the production process as a simple relationship between the single worker or unit of labor and the product that can be directly associated with the specific unit of labor. Actually, modern industry is a highly complex operation in which it is difficult to connect any small unit of labor with any specific unit of final product. Static theory assumes that increments of labor or capital can be associated with corresponding increments of output. In practice an increment of output is the combined result of labor and capital already existing in the enterprise in the form of fixed costs and a new increment of direct or variable cost.

Only the latter can be associated with the specific increase in output. An illustration of this complication is the fact that material-handling costs in a modern factory may make up a considerable part of total product costs, and material handling may be organized as an overhead service department, serving many different production departments.

The Actual Labor Market. Markets for labor, as with commodities, vary in their degrees of freedom. The markets for casual labor, domestic labor, and seasonal farm labor are highly competitive. In these occupations transfer from job to job is the normal habit; the money and social costs of movement are no obstacle to mobility. The wage scale rises and falls quickly with the balancing forces of supply and demand.

As skill and training increase, workers are subject to less competition and wage and salary scales are more stable. Competition among employers for labor acts only over the long term and usually in response to the transfer of industry. When textile mills moved from New England into South Carolina, the rice industry of South Carolina was forced to move farther south to Mississippi and Louisiana. The more productive jobs in textile mills decreased the labor supply for rice plantations.

Price competition for jobs among workers has been practically eliminated by labor organization and by short-term local standardization of wage and salary scales. As will be shown, the long-term level of American wage and salary scales has been upward.

Wage rates still differ from locality to locality because of important differences in job opportunities, because of differences in cost of living, because of differences in climate, and other offsetting attractions or disadvantages, although major regional differences are disappearing under national labor-union pressures.

Where labor is settled on the land, or where transfer is difficult for any other reason, there is little competition for labor among regions or among trades, and wide regional variations in wage scales may exist. In England during the late eighteenth century it was observed that the wage rates of agricultural workers varied in inverse proportion to their distance from the new factory centers. In 1794 wages for common labor varied from three shillings a day (with ale) down to little more than one shilling, depending on the distance from Lancashire, the center of the textile industry.[2]

Actual wage and salary scales comprise a system with strong cohesive forces of its own. External economic forces such as supply and demand have to reach a certain magnitude and to persist for a certain time before they can break down these internal cohesive forces. Equalizing forces act neither easily nor quickly, but they do act. But it is only in this way and to this extent that economic forces can be said to establish wage rates in an actual market.[3]

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[2] REDFORD, "Labor Migration in England," quoted by J. R. Hicks, "Theory of Wages," p. 75. Copyright, 1932. Used by permission of The Macmillan Company, New York, publishers.

Wages in the Open Market. A special case of the automatic adjustment of wage scales to commodity-market prices can be observed in the income of self-employed farmers and of other self-employed persons. "Wage scale" in this example is used broadly to include the income of self-employed persons.

The net income or annual wage of the self-employed farmer clearly depends on the volume of his cash crops and their market price less his production costs. Total production cost, including the farmer's own compensation, is equal to total market value. It cannot be otherwise because the farmer's net profit or loss is the equalizing factor.[4]

An example of this automatic adjustment of wages to market price is provided by the experience of potato growers in New York State that was referred to in another connection in Chap. 9.[5] When potatoes sold below 80 cents a bushel, the return per hour of labor received by the self-employed farmer averaged 31 cents per hour (in various years from 1914 to 1941). There was a loss of 21 cents per hour when potatoes sold for 31 cents a bushel in 1931; farmers paid out 21 cents per hour for the privilege of working. They earned a wage of $1.07 an hour when potatoes sold for 67 cents a bushel in 1941. Then in an equal number of years from 1915 to 1943, when potatoes sold above 80 cents a bushel, the average wage was $1.02 per hour, with a high rate of $2.33 per hour when potatoes sold for $2.03 a bushel in 1925.

The returns per man-hour (which may be called the wage rate) of self-employed labor on Southeastern farms varied from 16 or 17 cents in cotton or tobacco down to only 3 to 5 cents (per man-hour) in corn, wheat, or oats.[6]

The point was made in connection with the cost and revenue relationships of farm operations that the net income and wage rate of farm owners is roughly proportional to yield per acre and market price. The wage rate of a typical farm family is not a question of a just wage or a fair wage, or even a living wage. The wage rate in this relatively free market is determined by the impersonal factors of yield per acre and market price. And yields per acre for corn varied (in 1941) from 15 bushels in Southwestern states to 51 bushels in Iowa and Illinois. Market price varied from 32 cents a bushel in 1932 to $1.09 in 1944 and over $2.50 in 1947.[7]

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[3] *Ibid.*, pp. 86–87.

[4] *Ibid.*, pp. 86–87.

[5] See footnote, p. 190, Chap. 9.

[6] VANCE, RUPERT B., "All These People," p. 177, The University of North Carolina Press, Chapel Hill, 1945. The figures quoted are averages for the years 1923 to 1932.

[7] See Chap. 9, Table 9 · 2, p. 186; also Table 9 · 3, p. 187.

Wage Rates and Employment. One of the basic conclusions of classical theory founded on the assumption of perfect competition and equilibrium is that there can be no long-continued mass unemployment. Unemployment to the classicist is a sure sign that the market is in a transitional stage or that external conditions are preventing the free play of the economic forces of supply and demand and marginal cost.

According to these principles there is at all times and under all conditions a "right" price for labor (a wage scale) that will "clear the market." Wage rates in an open market are fixed by the interplay of supply and demand and marginal cost, and there is a continuous tendency for unemployment to disappear. If, however, wage rates are maintained at an artificially high level by government laws or by labor-union pressures, then the available supply of labor will not be fully employed. If the controlled wage scale is higher than the natural scale for a large part of the labor force, and this condition is long continued, permanent mass unemployment will be the result.

Ludwig von Mises stated this orthodox theory very lucidly in "The Myth of Mixed Economy," which was quoted in Chap. 6.[8] Because of this logical conclusion—logical only under the assumed conditions of the static state—the classical economists practically ignored unemployment as a problem worthy of study. Unemployment to the classicist was a symptom of the attempt by labor to secure a higher wage than the natural market rate. The cause of unemployment—a rigid wage structure—not its symptom of unemployment—should be treated and corrected. Given the right wage, mass unemployment would take care of itself.

Urban workers with their relatively fixed living costs and complete dependence on wages for income can accept the "right" wage scale of this static theory no more easily than producers with large, fixed production costs can live under the "right" prices of open commodity markets. The "right" wage resulting from perfect competition is a completely unacceptable solution under modern industrial conditions.

Completely open markets for hired labor are as impracticable and as socially unsatisfactory as completely open commodity markets are for the development of new products. There are many factors other than price in real markets that determine demand for commodities. There are many factors other than the wage scale that determine demand for labor. The effective demand for labor clearly is determined by the effective demand for the commodities and services which labor produces. Most of the discussion of demand schedules of commodities in Chap. 4 can be applied to demand schedules of labor. The static law of supply and demand and price cannot be applied to the actual labor market, as was done by Dr. Mises, unless many reservations are made.

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[8] Refer to p. 118.

There is no simple rule that relates the wage scale to employment in actual markets. The relationship is complex and varies with conditions and circumstances. Where individual employers deal with individual workers, as in domestic service and in small business concerns, the "free play of the forces of competition" is obviously important. The wage scale may greatly influence the volume of employment under these conditions, and unemployment can be alleviated by a reduction in wages and prices. On the other hand, where employer and employee units are large and strongly organized, a "free market" exists for neither labor nor goods. Under these conditions the wage scale may or may not determine the volume of employment, depending on other conditions.

It is also necessary to remember that wages are at once income to the wage earner and cost to the employer. If wage rates and total wages go up, the workman's purchasing power is increased, but the producer's costs may also be increased. The average level of prices may or may not be increased because of an increase in the wage scale, depending on the existing circumstances such as production per man-hour, unit labor cost, and the existing profit margins.[9]

It was seen in the weaver-shoemaker model (Chap. 7) that maximum employment depends, for one thing, on earning power being evenly distributed among different trading groups. The average level of economic activity depends on the exchange of goods for goods, and the maximum volume of exchanges will be attained when earning power is distributed most widely and evenly. Automobile workers or steel workers earning $3,000 to $4,000 a year cannot exchange goods with share croppers with money incomes of $100 a year except on the level of the lower income. Sharecroppers do not as a rule buy new automobiles. Nor can wealthy industrial countries trade with bare subsistence farming economies except on the low, per capita income level of the poor country.

There are so many factors that influence people in the spending of their money that it is difficult to say whether a higher wage scale would reduce employment or whether a lower wage scale would increase employment in any specific situation. But it can be said with assurance that higher wages that are earned through greater productivity operate to increase wages without increasing prices, and will, as a rule, increase the demand for goods and consequently, the demand for labor. This situation is desirable on all counts.

When wage increases are neither earned through greater production nor offset by cost reductions in other factors, and do result in price increases, the effect on buying and on employment will usually be neutral or adverse. The wisdom of a wage increase that requires a simultaneous price increase may always be questioned except in the low-productivity, handicraft industries where both wage and price levels may be too low judged by their social consequences.

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[9] See pp. 268–270, Unit Labor Costs, for additional and more specific treatment of this point.

There are two counteracting effects generated by wage increases when the wage increase affects only a limited group of workers and when prices are increased. Purchasing power of those receiving the higher wages is increased, but the higher prices operate to restrict the buying power of the larger body of consumers whose incomes have not been increased. Usually the second effect is more powerful than the first, and the net result is usually a decrease in over-all sales and employment.

If the wage and the price increases were so general and so uniformly distributed as to affect all workers and all commodity prices in the same way, the increase in the price level would balance the buying power of the increased wages. But even under this unrealistic assumption there would still remain large numbers of consumers whose incomes do not come from wages and salaries and whose buying power would be reduced by the higher price level.

There is still another set of conditions of considerable practical importance. If the total volume of sales and production and the general price level are both assumed to remain the same, an increase in the wage scale of a part of the labor force can be paid only by a decrease in total employment. An increase in wage rates may increase mechanization and so reduce the total man-hours (required for the fixed volume of production). Fewer workers will be employed, or the original number of workers will be employed fewer hours.

The private capitalistic system has a way of protecting itself against unearned wage and other costs by automatically establishing offsetting adjustments in prices or employment. The ever-present monitor and regulator is the profit-and-loss statement of individual enterprises (which was explained in Chap. 10). Expenditures cannot for long exceed income. These automatic adjustments usually hurt some part of the people, but they cannot be repealed by law, by exhortation, or by pressure groups.

Development of Wage Scales in the United States. From colonial times the American wage and price structure has been on a relatively high level. This has been the result of a favorable combination of conditions and the attraction that these conditions offered to adventurous, freedom-loving, ambitious men of more than average energy and ability.

In colonial times and during the early decades of the Republic there was a small supply of workers compared with the number of jobs that were available. There were wide opportunities for highly productive employment in a new land of rich and undeveloped natural resources. If an ambitious man was dissatisfied with the wages offered by an employer, he could, if he possessed the necessary energy and ability, strike out for himself and develop a business of his own or take up new land. There were more opportunities than there were men able to grasp them. And these conditions have continued, although opportunities have taken different, less obvious and more complicated forms. At any period and under all conditions, successful self-employment requires an adventurous spirit that enjoys risk, more than average self-confidence, and rare qualities of initiative and imagination. Even in the early decades of the Republic there was serious mass unemployment in the cities during recurring depression, in spite of new frontiers, free land, and a rapidly growing population.

Before 1930 and the social and political changes that came with the Great Depression, the level of wages and salaries in the United States was determined very largely by what employers were able and willing to pay or by what workers were willing to take. The government took no part in wage determination, and labor unions had little power except in the construction industry and in a few skilled crafts. The relative bargaining strength of employer and worker shifted with the business cycle. During good times when there was little unemployment, and demand for labor was strong, workers were able to increase the wage level; in times of poor business employers were in a stronger bargaining position and were in a better position to establish a lower wage scale. Under these relatively open market conditions of more than a century, American real wages increased irregularly, but the trend was steadily upward. Money wages increased spectacularly, but the cost of living also increased spectacularly. Nevertheless, real wages, measured in terms of food, clothing, and shelter, increased substantially. Over the shorter period from 1900 to 1929 money wages increased, largely because of the voluntary action of employers and the demand for labor, from 9 dollars to 25 dollars a week, while hours per week declined from 54 to 45. Real wages increased 27 per cent. These figures and their significance will be discussed presently.[10]

Between 1930 and 1933 a new wage philosophy developed as a result of the depression. As the effects of the 1929 crisis became more evident in 1930 and 1931, the Hoover Administration exerted its strong influence on business managements to prevent wage reductions on the theory that wage rates and weekly earnings should be maintained in order to "maintain purchasing power." This government policy was the first official American application of the spending and purchasing-power theory of employment and of the doctrine that high wages, irrespective of their effects on costs, could be a constructive economic force and could stop the downhill rush of depression.

[10] Refer to Table 12 • 1, p. 255 of this chapter.

This new policy, started by Hoover, was crystallized into law, and its application was expanded greatly under the Roosevelt Administrations. From 1935 to 1938 there was a succession of laws to encourage higher wages. The effective campaigns of the newly organized CIO unions also contributed to the increase in average scales independently of business conditions and costs.

National Wage Policy and Employment. Because of the many factors other than wages, that determine the demand for labor, it is difficult to segregate the effect of national wage policy on employment. However, national experience during the 1930's provides some basis for judgment and opinion. Beginning with 1933, and especially with the passage of the Wagner Act in 1935, the policy of the United States government was clearly directed toward increasing wages as a prerequisite to stabilized production and employment and without much, if any, consideration given such factors as business conditions and production per man-hour. There is also no question that this high-wage policy was actively applied throughout the 1930 decade. It is equally clear that the policy of maintaining wages at a high level by law and indirectly by encouraging the organization of labor into industry-wide unions, did not bring about full employment. The long-continued mass unemployment of 1931–1940 was unique in American business history in its extent and duration. During no other period did mass unemployment last so long and remain so high at times when business was good (as in 1936–1937, and again in 1939–1940). It is reasonable, then, to hold the change in national wage policy that occurred around 1930–1933 responsible, at least in part, for this distinctive experience.[11]

Further discussion of the causes of general unemployment must await the development of the principles that determine total national economic activity measured by such aggregates as national income and total investment.

Government Control of Wage Rates. When in democratic countries economic and business problems become political issues, the solutions are apt to follow political rather than economic principles. And political solutions seldom lead to economy in the use of labor or money.

The Second World War and the immediate postwar years provided an object lesson in some of the problems and complications that arise from government intervention in labor-management disputes. For political reasons, primarily, the Federal government was in favor of higher wages, and there was little, if any, recognition among government officials of the principle that real wages must be earned. The Administration policy, when the fighting war ended, was to encourage higher wage scales to maintain purchasing power in the expectation of postwar depression, without regard to the effect of higher wages on production costs and prices.

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[11] These are opinions expressed by Professor Leo Wolman of Columbia University at a meeting of the American Management Association in New York City, Sept. 29, 1944. He is recognized as one of the leading conservative economists of the country who has specialized in the field of labor economics.

The British Labor government faced similar wage-policy problems. The Coal Industry Bill is a pertinent example. This bill sets up The National Coal Board which is responsible for the development and administration of the British coal industry.

The bill requires the Board to make "supplies of coal available in such quantities and at such prices as may seem to them best calculated to further the public interest." The Board is also instructed to advance the safety, promote the health and welfare of the miners, and balance the books "on the average of good and bad years." It is not difficult to see that low prices will be "in the public interest," and that the "welfare of the miners" will justify an increasing wage scale and a shorter work week. Both of these policies are highly desirable and need not be incompatible if the hoped-for increasing productivity and cost reductions in the industry are realized by the Board.

It may be reasonably assumed that higher *future* production per man-hour will be depended on to justify higher wages, lower prices, or both, in the *present*. But if sufficiently higher productivity is not achieved to cover high wages and low prices, it may be predicted with considerable confidence that the "balancing of the books" will run a poor third to higher wages and lower prices.

In the United States the effects of government control of prices and wages may be observed in the history of American railroads. The Interstate Commerce Commission controls the general rate structure, and the Railway Labor Act has operated in such a way as virtually to control railroad wages.

The history of mediation in railroad wage disputes differs little from mediation and arbitration in other industries. Government mediation boards or arbitration boards can do little except agree with or scale down the labor-union wage demand, thus giving mediation a superficial appearance of compromise. In mediation or arbitration the union gives up nothing except a strategic bargaining position, but the owners give up a substantial part of earnings or the public pays more for the service. And the union can always come back for another "compromise."

While wage increases are usually made in the assumed interest of the wage earners, the anticipated benefit may not be realized if the higher wages are not earned. It was remarked (page 250) that the system of private capitalism has ways of protecting the system from the consequences of unearned costs. Railway wage increases illustrate this impersonal economic behavior.

Between 1921–1925 and 1936–1940 American railroads, as a result of "mediation," increased average pay per hour by 42 per cent, but total employment declined from 1,772,000 to 1,047,000 workers and total payrolls of class I railroads declined from $2,820 million to $1,882 million.[12] During the same period the financial condition of the roads deteriorated, and the dividend return received by the owners was cut in half.

In his book on "Full Employment," Sir William Beveridge places the major responsibility for preventing a destructive spiral of increasing wage rates and prices in Britain on organized labor. Government's responsibility is to maintain "a definite policy of stable prices." Industry managers are expected to cooperate with government and labor, but apparently would have little do do with deciding these important questions. Sir William hopes that labor will be "reasonable" in its wage demands.

Nor has the government administration in the Soviet Union, even with its dictatorial powers, found the answer. Wage rates and prices moved up together, as nearly as can be determined from the meager statistics that are available. Wages in state-operated industry increased from 450 rubles in 1924–1925 to 3,100 rubles in 1937–1938. This inflation in wage rates was matched by an equal or greater increase in living costs, so that the increase of more than six times in money wages resulted in no sensible improvement in living conditions.

There is little in these plans and experiences to inspire confidence that government control or mediation of the wage scale is a satisfactory solution of this troublesome problem. The problem has been solved, not without conflict, under private enterprise by collective bargaining. But collective bargaining has been most successful when government has been absent. Agreement between the two most interested parties must be reached in the absence of government intervention within the limits imposed by ability and willingness to pay on management's side and the willingness to strike on the labor side. This solution achieved under private capitalism up to the 1930's is by no means ideal, but it worked sufficiently well to maintain the balances necessary for the solvent operation of the economy and a gradual upward trend in real wages.

Wage Rates in the United States. One generally accepted set of statistics of money wages, in manufacturing, cost of living, and real wages (in terms of weekly earnings and hours worked per week) is given in Table 12·1.[13] A word of warning regarding wage statistics is necessary. No two compari-

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[12] For another example in the steel industry see p. 276.

[13] This table is taken from "Wages and Prices" by Jules Backman, published by the Foundation for Economic Education. The original sources given by Professor Backman are: P. H. Douglas, "Real Wages in the United States, 1890–1926," Houghton Mifflin Company, Boston, 1930, and U.S. Bureau of Labor Statistics, adapted from "Wages during the Transition," p. 74.

Table 12·1. Actual and Real Wage Rates in Manufacturing—Cost of Living and Hours of Work per Week—1900–1948
All Index Numbers Based on 1939 = 100

Year	Hours of work	Actual earnings				Cost-of-living index	Real earnings			
		Weekly		Hourly			Weekly		Hourly	
		Dollars	Index	Dollars	Index		Dollars	Index	Dollars	Index
1900	54.5	$ 9.19	38.5	$0.169	26.7	56.9	$16.15	67.7	$0.296	46.8
1901	54.2	9.27	38.9	0.171	27.0	58.3	15.90	66.6	0.293	46.3
1902	53.9	9.54	40.0	0.177	28.0	59.7	15.98	67.0	0.296	46.8
1903	53.5	9.85	41.3	0.184	29.1	62.6	15.73	65.9	0.294	46.4
1904	53.3	9.82	41.2	0.184	29.1	61.9	15.86	66.5	0.298	47.1
1905	53.3	9.94	41.7	0.187	29.5	61.9	16.06	67.3	0.301	47.6
1906	52.9	10.24	42.9	0.194	30.7	64.0	16.00	67.1	0.302	47.7
1907	52.9	10.62	44.5	0.201	31.8	67.5	15.73	65.9	0.297	46.9
1908	52.5	10.24	42.9	0.195	30.8	64.7	15.83	66.3	0.302	47.7
1909	52.5	10.32	43.3	0.197	31.1	64.7	15.95	66.8	0.304	48.0
1910	52.3	10.61	44.5	0.203	32.1	68.3	15.53	65.1	0.297	46.9
1911	52.1	10.69	44.8	0.205	32.4	68.3	15.65	65.6	0.300	47.4
1912	51.7	11.06	46.4	0.214	33.8	72.5	15.26	64.0	0.295	46.6
1913	51.3	11.41	47.8	0.222	35.1	71.1	16.05	67.3	0.313	49.4
1914	51.0	11.42*	47.9	0.224	35.4	72.2	15.82	66.3	0.310	49.0
1915	50.8	11.76	49.3	0.232	36.7	72.9	16.13	67.6	0.318	50.2
1916	50.7	13.17	55.2	0.260	41.1	78.4	16.80	70.4	0.331	52.3
1917	50.4	15.61	65.4	0.310	49.0	92.2	16.93	71.0	0.336	53.1
1918	49.5	19.93	83.5	0.403	63.7	108.1	18.44	77.3	0.373	58.9
1919	47.8	22.33	93.6	0.467	73.8	125.3	17.82	74.7	0.373	58.9
1920	47.1	26.66	111.7	0.566	89.4	144.1	18.50	77.5	0.393	62.1
1921	46.8	22.72	95.2	0.486	76.8	128.5	17.68	74.1	0.378	59.7
1922	47.3	21.90	91.8	0.463	73.1	120.4	18.20	76.3	0.385	60.8
1923	47.3	24.09	101.0	0.509	80.4	122.6	19.65	82.4	0.415	65.6
1924	45.4	24.20	101.4	0.533	84.2	122.9	19.60	82.1	0.432	68.3
1925	46.3	24.65	103.3	0.532	84.0	126.2	19.53	81.9	0.422	66.7
1926	46.5	24.93	104.5	0.536	84.7	127.2	19.60	82.1	0.422	66.7
1927	46.3	25.02	104.9	0.540	85.3	124.7	20.06	84.1	0.433	68.4
1928	46.1	25.25	105.8	0.548	86.6	123.3	20.48	85.8	0.444	70.1
1929	45.7	25.31	106.1	0.554	87.5	123.2	20.54	86.1	0.450	71.1
1930	43.5	23.51	98.5	0.541	85.5	120.1	19.58	82.1	0.450	71.1
1931	41.7	21.11	88.5	0.506	79.9	109.4	19.30	80.9	0.463	73.1
1932	38.3	17.05	71.5	0.445	70.3	98.2	17.36	72.8	0.453	71.6
1933	38.1	16.73	70.1	0.439	69.4	93.0	17.99	75.4	0.472	74.6
1934	34.6	18.40	77.1	0.532	84.0	96.3	19.11	80.1	0.552	87.2

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* 7 months average (1914).

Table 12·1. Actual and Real Wage Rates in Manufacturing—Cost of Living and Hours of Work per Week—1900–1948—(*Continued*)
All Index Numbers Based on 1939 = 100

Year	Hours of work	Actual earnings				Cost-of-living index	Real earnings			
		Weekly		Hourly			Weekly		Hourly	
		Dollars	Index	Dollars	Index		Dollars	Index	Dollars	Index
1935	36.6	20.13	84.4	0.550	86.9	98.7	20.40	85.5	0.557	88.0
1936	39.2	21.78	91.3	0.556	87.8	99.7	21.85	91.6	0.557	88.0
1937	38.6	24.05	100.8	0.623	98.4	103.3	23.28	97.6	0.603	95.3
1938	35.6	22.30	93.5	0.626	98.9	101.4	21.99	92.2	0.618	97.6
1939	37.7	23.86	100.0	0.633	100.0	100.0	23.86	100.0	0.633	100.0
1940	38.1	25.20	105.6	0.661	104.4	100.8	25.00	104.8	0.656	103.6
1941	40.6	29.58	124.0	0.729	115.2	105.8	27.96	117.2	0.689	108.9
1942	42.9	36.65	153.6	0.854	134.9	117.2	31.27	131.1	0.729	115.2
1943	44.9	43.14	180.8	0.961	151.8	124.3	34.71	145.5	0.773	122.1
1944	45.2	46.08	193.1	1.020	161.1	126.3	36.48	152.9	0.807	127.5
1945	43.4	44.41	186.1	1.023	161.6	129.2	34.37	144.0	0.792	125.1
1946	40.4	44.14	185.0	1.093	172.7	130.9	32.16	141.3	0.796	125.8
1947	40.3	49.26	206.4	1.221	192.9	160.2	30.75	128.8	0.762	120.4
1948	40.1	53.14	222.7	1.327	209.6	172.2	30.86	129.3	0.771	121.7

sons will agree exactly. Studies of average wage rates even for the same corporation, made for different purposes, for different periods, or by different people, will generally give different results. These differences may be quite important in practical wage negotiations between labor organizations and employers, but they are not important for the present purpose. All we are interested in is the general trend of wage rates.

In Table 12·1 actual money wages are converted into "real" earnings by dividing actual earnings by a "cost-of-living" index compiled by the U.S. Bureau of Labor Statistics. Real earnings are earnings in terms of a constant level of prices that reflect the living expenses of a typical low-income family.

The index of cost of living is a price index based on the published market prices of goods and services included in a typical budget of low-income families in which food, clothing, rent, and other necessary expenses are the main items. The index shows how the living expenses of this typical low-income family varied over the years. Obviously, the same cost-of-living index, compiled for a typical low-income budget, should not be applied to higher income salary earnings.

During The Second World War the War Labor Board established this BLS cost-of-living index as the basis for controlling wage increases. Union labor objected that it did not indicate the full increase in living expenses, principally because it did not register the deterioration of quality of many products and the additional cost of substituting higher priced articles for lower priced lines that could not be found on the market; nor did the official index recognize black-market prices. These were legitimate criticisms, and the official index could not be supported completely, But for our purpose of making a rough correction for increase in the cost of living, and converting money wages into real wages, the official BLS index is adequate.

The most startling impression one gains from this long record is the gain in money wages. Money wages in manufacturing industry increased from just above 9 dollars for 54.5 hours of work in 1900 to 53 dollars for 40.1 hours' work in 1948, or more than six times in weekly earnings. Average hourly earnings increased from 17 cents to $1.33, or more than eight times. But a large part of this spectacular increase in money wages was absorbed in the increased cost of necessities. Real weekly earnings (in 1939 dollars) increased from $16.15 to $30.86, or real wages just about doubled. Closer examination shows that all of the gain in real wages occurred after 1915. There was no gain from 1900 through 1915. From 1915 to 1929 there was a slow, but fairly regular, gain amounting to 27.3 per cent during 14 years, or an average annual gain (compounded) of 1¾ per cent. It was not until 1936 that the 1929 rate was reached again. Then, between 1935 and 1946 real weekly earnings increased 57.6 per cent during 11 years, or at the high average annual rate of slightly over 4 per cent (compounded). These figures would be increased if the reduction in hours per week were taken into account.

Real hourly earnings increased more than weekly earnings because of the considerable decrease in working hours per week. Over the entire period from 1900 to 1948 real hourly earnings increased 160 per cent, which is at the compound annual rate of nearly 2⅛ per cent. For the 14 years from 1915 to 1929 the compound annual rate was 2½ per cent; for the second period of rapid growth from 1935 to 1946 the compound annual rate was 3½ per cent. In this latter period weekly earnings increased at a higher rate than hourly earnings because of an increase in working hours.

Over a longer period of 90 years—from 1850 to 1940—real hourly earnings of factory wage workers increased 346 per cent, which is at an average annual rate compounded of about 1⅜ per cent.

It is instructive to look at the increase in real wages over this period of 90 years by decades. The figures are given in Table 12 • 2.

Wage Rates and Production per Man-hour. It is a matter of experience that wage rates are relatively high as a rule in industries having high production per man-hour and wage rates are relatively low in industries with low production per man-hour. Average real wages also are high in countries with high average production per man-hour. Variation in production per man-hour from industry to industry and from occupation to occupation leads to similar variation in actual market rates. These effects of production per man-hour on the wage structure are consistent with the fundamental principle that real wages can be paid only out of production; that higher real wages can be earned only by higher production per man-hour.

This close relationship between real wage rates per hour and production per man-hour can be shown statistically by combining the production per man-hour figures of Table 11·1 (Chap. 11, page 222) and the real hourly earnings of Table 12·1. These figures are brought together in Table 12·3.

Table 12·2. Real Hourly Wages in Manufacturing, 1850–1940*

Year	Index of real hourly wages	Per cent increase by decades	Per cent increase over 30 years
1850	100		
1860	103	3.0	
1870	124	20.4	98
1880	149	20.2	
1890	203	36.2	
1900	211	4.0	
1910	212		
1920	265	25.0	110
1930	314	18.5	
1940	446	42.0	

* Figures compiled by Dr Willford I. King of New York University from various sources, and published by the Committee for Constitutional Government, New York, 1947.

Fabricant's index figures for production per man-hour in Table 11·1 are based on 1899 as 100, and the compilation of wage rates and living costs given in Table 12·1 starts with 1900 and uses 1939 as the base year. Consequently, it is necessary to recalculate Fabricant's index with 1939 as 100, which has been done in making up Table 12·3.

The data of Table 12·3 are shown graphically in Fig. 12·1. If all values of hourly earnings were directly and exactly proportional to values of production per man-hour, all points would fall on the 45-degree diagonal line. The location of the actual points with respect to the diagonal line show how closely this exact relationship is approached; in other words, how closely actual average hourly earnings are directly proportional to production per man-hour. From 1919 to 1931 real earnings increased at a lower rate than productivity. During this period the gains from increased production per man-hour were shared by wage earners and other workers, by customers (through lower prices), and by owners. Over the entire period real hourly earnings increased at about the same rate as production per man-hour.

It is a well-known fact that over the past 15 years wage earners in manufacturing industries have increased their average earnings at a higher rate than clerical workers, and, in many cases, faster than professional engineers, supervisors, and other highly trained men who are vitally important to economic progress. In many cases the groups which are most responsible for increases in the productivity of industry have profited less than other groups which have contributed less. There is no support in these statistics for the opinion that the rank-and-file worker has been treated unfairly in the distribution of the benefits of increased productivity.

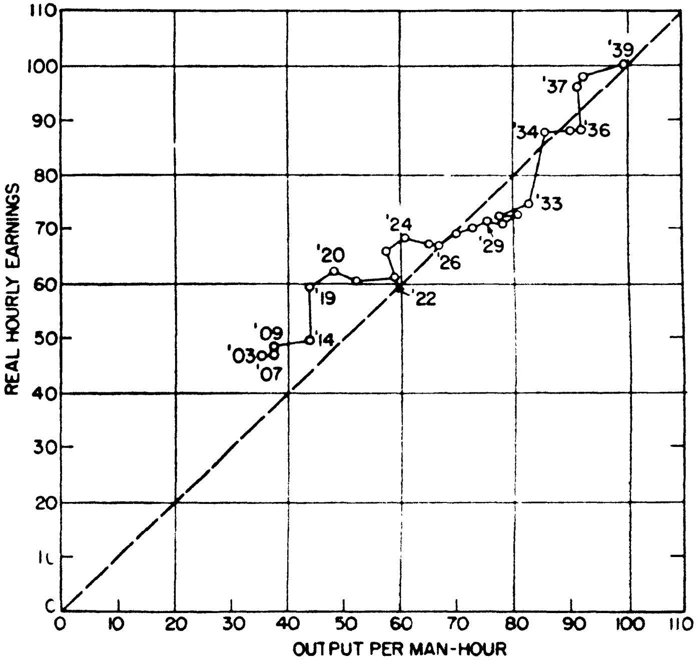

Fig. 12 • 1. Relation between Output per Man-hour and Real Hourly Earnings
From 1903 to 1939 real hourly earnings in manufacturing increased approximately in step with output per man-hour.

Production per man-hour determines the maximum wages that can be paid out of production without taking more than a fair share of the total proceeds. There is no immovable ceiling that fixes the wage scale. Wage rates can be increased in the future as they have in the past up to any level, limited only by the highly flexible ceiling of production per man-hour. No wage scale is "too high" if it is earned by more and more production.

Figure 12 • 1 alone is sufficient justification of the American industrial system if justification were needed. And any competing system, whether founded on democratic or totalitarian state planning, communism, or socialism, must show equally good results before it can be called successful and before it should have any attraction for American workmen and for the American people. The simple fact is that no other nation's economic system has been able to show equal performance.

Table 12·3. Output per Man-hour and Real Hourly Earnings—1903–1939

Year	Output per man-hour		Real hourly earnings	
	1899 = 100	1939 = 100	Dollars	1939 = 100
1903	110	35.6	$0.294	46.4
1907	118	38.1	0.297	46.9
1909	118	38.1	0.304	48.0
1914	137	44.2	0.310	49.0
1919	135	43.8	0.373	58.9
1920	150	48.6	0.393	62.1
1921	163	52.7	0.378	59.7
1922	182	58.8	0.385	60.8
1923	177	57.3	0.415	65.6
1924	189	61.0	0.432	68.3
1925	201	65.1	0.422	66.7
1926	208	67.2	0.422	66.7
1927	214	69.3	0.433	68.4
1928	226	73.1	0.444	70.1
1929	233	75.5	0.450	71.1
1930	241	78.0	0.450	71.1
1931	252	81.5	0.463	73.1
1932	240	77.7	0.453	71.6
1933	256	82.9	0.472	74.6
1934	265	85.8	0.552	87.2
1935	281	90.9	0.557	88.0
1936	285	92.1	0.557	88.0
1937	281	90.9	0.603	95.3
1938	284	91.9	0.618	97.6
1939	309	100.0	0.633	100.0

Wage Rates and Mechanical Power. In Chap. 11, Fig. 11·3, production per man-hour was shown to vary approximately in proportion to the horsepower available to each wage earner in manufacturing industry. It has just been shown by Fig. 12·1 that average hourly real earnings in manufacturing vary roughly in direct proportion to production per man-hour. It can be deduced from these two relationships that average hourly real earnings also vary directly with the mechanical horsepower available to each wage earner. High earnings go with high values of mechanical horsepower and, of course, with the associated power-driven tools and equipment that translate power into production. The data of Tables 11·7 and 12·3 have been combined in Table 12·4 and Fig. 12·2 (with 1939 as 100).

There is one implication of this relationship that should be mentioned. Because a rising wage scale depends on more and more mechanization, and mechanization, in turn, depends on more and more capital investment, the wage scale, it would seem, rests on capital investment. We shall discover in a later chapter that one of the important sources of capital for manufacturing has been the earnings of industry that are available for reinvestment in the business. We have thus made the surprising, but logical, deduction that high wages depend on high profits (assuming that owners and managements are alert to the advantages of reinvesting dividends and retained profits).

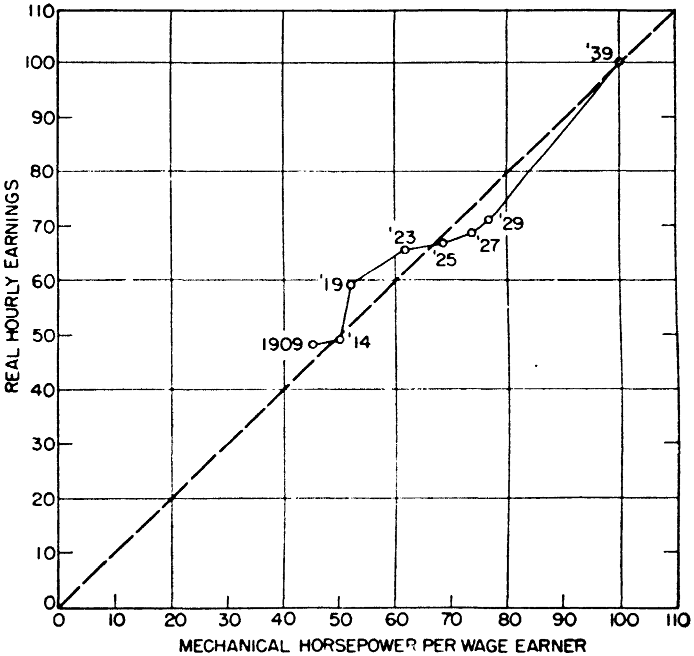

Fig. 12 · 2. Relation between Horsepower per Wage Earner and Real Hourly Earnings

Because production per man-hour varies approximately in proportion to horsepower available to each wage earner in manufacturing, and because real earnings per hour vary in step with production per man-hour, it can be deduced that average hourly real earnings also vary directly with the amount of mechanical horsepower available to each worker. Real wages therefore depend on the capital invested per worker.

There is a popular impression that high profits come out of labor's share of the proceeds of industry and that high profits are inimical to the interests of labor. But profits wisely invested in the business lead to higher wages; thus ample profits wisely invested are seen to be in the real interests of labor.

The Workers' Share of Production. It seems desirable to discuss aggregate wages as a share of national product at this point, although it introduces the concepts of national product and income and the distributive shares of the national income which are presented in considerable detail in the next chapter. National *income* statistics were referred to in Chap. 2. These national income figures are the realized income received by individuals. The national *product* is a more inclusive figure that measures the aggregate market value of aggregate production of goods and services.[14]

Table 12·4. Real Hourly Earnings and Mechanical Power per Worker

Year	Horsepower per employed wage earner		Real hourly earnings
	1899 = 100	1939 = 100	
1909	132	45	48.0
1914	150	50	49.0
1919	154	52	58.9
1923	184	62	65.6
1925	201	69	66.7
1927	216	74	68.4
1929	224	77	71.1
1939	292	100	100.0

Table 12·5 shows the Department of Commerce statistics of gross national product and of private wages and salaries received by hired workers. These figures show that the ratio of wage and salary payments to gross national product—the workers' share of production—has remained surprisingly constant over these 18 years. This ratio has varied only from 40.9 per cent to 44.8 per cent (omitting the abnormally low rates of 1944 and 1945 caused by war conditions). This means that the total wage and salary fund has followed closely the ups and downs of the total value of production. Employees working for wages and salaries received just about the same share of total production in 1929 as they did in 1946 and 1947, despite the revolutions that have occurred in union labor-management relations, in the price and wage levels, and in the market value of the national product. Historically, the only way in which the wage and salary fund has been increased materially has been by increasing total production by more man-hours or by more production per man-hour, and usually by both. Wage and salary increases made in one segment of the economy without a corresponding increase in market value of production are made largely at the expense of wages and salaries of some other segment of the economy. This deduction follows inevitably from the historical record. It also shows that the only effective way to increase average money incomes is to increase the market value of production, and the only effective way to increase real incomes (without price increases) is to increase production per worker. This has been said before, but it can stand repetition.

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[14] The reader should refer to the discussion of Chap. 13 if more information about national product statistics is desired at this point.

Relative Size of Wage and Salary Payments. There may be a lurking suspicion that although total wage and salary payments have maintained a constant ratio to production, as just shown, salaries, and especially large salaries, may have gained at the expense of wages. The history of large salaries will be discussed later on. The total of the distribution of income between wage earners and all salaried employees for 20 years prior to 1929 is shown by Table 12·6, taken from a study made by the Brookings Institution.[15]

Table 12·5. Relation of Wages and Salaries to National Product*—1929–1947

Year	Gross national product, millions	Private wages and salaries	
		Millions	Per cent national product
1929	$103,828	$45,206	43.5
1930	90,857	40,720	44.8
1931	75,930	33,607	44.2
1932	58,340	25,297	43.4
1933	55,760	23,660	42.4
1934	64,868	27,420	42.3
1935	72,193	29,984	41.5
1936	82,483	33,866	41.1
1937	90,213	38,432	42.6
1938	84,683	34,564	40.8
1939	90,426	37,519	41.5
1940	100,477	41,130	40.9
1941	125,294	51,537	41.1
1942	159,628	65,628	41.1
1943	192,573	78,671	40.9
1944	212,231	83,333	39.6
1945	213,429	82,046	38.5
1946	209,266	91,016	43.5
1947	231,636	104,727	43.4

* Source *Survey of Current Business*, Tables 1 and 2, p. 16, U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D. C., July, 1948.

The share going to wage earners decreased and the share going to salaried employees increased, but these relative changes can be accounted for by the shift of workers from the hourly paid group to the salaried group.

Wage earners declined from 57.1 per cent of gainful workers in 1910 to 54.3 per cent in 1930; during the same period salaried employees increased from 16.6 per cent to 25.4 per cent.[16] Over a longer period this shift from hourly paid to weekly (or monthly) paid employees is still more marked. For example, salaried employees increased from one-tenth of the working force in 1880 to 27 per cent in 1939. In 1880 salaried workers were only one-fifth as numerous as that part of the working force receiving wages, but in 1939 this group was half the size of the hourly paid group.

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[15] "America's Capacity to Consume," Table 10, p. 158, Brookings Institution, Washington, D.C. 1934.

Table 12·6. Distribution of Income Payments between Wage Earners and Salaried Workers—1909–1929

Period	Total income received by employees, billions	Per cent received by wage earners	Per cent received by salaried employees
1909	$15.090	69.9	31.1
1910–1914	17.538	68.6	31.4
1915–1919	27.071	66.7	33.3
1920–1924	40.717	66.3	33.7
1925–1929	49.960	64.5	35.5

A smaller labor group limited to *industrial* wage earners, making up two-thirds of all wage earners in 1939, increased from 29 per cent of all gainful workers in 1880 to 35 per cent in 1930 and an estimated 34 per cent in 1939. Therefore because all wage earners increased from only 52.7 per cent to 54.3 per cent (1880–1939) industrial wage earners increased in relative importance with respect to all other wage earners. The wages of industrial wage earners have been remarkably steady as a per cent of national income over the period 1919–1938, but on the whole have declined. The highest ratio occurred in 1920 at 28.4 per cent, when both wage rates and cost of living had increased greatly, and the lowest ratio was in 1933 at 21.6 per cent. A truer picture of the trend is shown by the selected 3-year periods of Table 12·7.

Table 12·7. Trend of Industrial Wage Payments

Period	Industrial wages, billions*	National income, billions†	Wages of per cent of national income
1922–1924	$18.069	$68.133	26.5
1927–1929	20.533	83.000	24.7
1932–1934	9.901	44.867	22.1
1936–1938	15.589	66.300	23.5

* Bell, Spurgeon, "Productivity, Wages and National Income," p. 12, Brookings Institution, Washington, D.C., 1940.

† Kuznets, Simon, "National Income and Its Composition, 1919–1938," Table I, p. 137, National Bureau of Economic Research, Inc., New York, 1941.

[16] BELL, SPURGEON, "Productivity, Wages and National Income," p. 10, Brookings Institution, Washington, D.C., 1940.

It is indeed remarkable that this distribution has remained so nearly constant in spite of the extreme changes in the size of the national income and the differences that exist among industries. But this stability applies only to the entire group of industrial wage earners. It does not follow from these figures that strongly organized groups have not increased their share of the total "pot," but these figures do show that if this has been accomplished, it has been at the expense of the rest of the industrial wage group. These favored groups have, in all probability, received a larger share of a smaller cut of the national income, and during the two latter periods shown (1932–1934 and 1936–1938) this has been at the expense of a large body of unemployed.

Table 12·8. Ratio of Wages to Value of Products in Manufacturing*

Year	Wages, millions	Value of products, millions	Ratio
1899	$1,893	$11,033	0.17
1904	2,441	14,253	0.17
1909	3,206	19,945	0.16
1914	3,709	23,050	0.16
1919	9,611	59,964	0.16
1921	7,451	41,650	0.18
1923	10,149	58,181	0.17
1925	9,980	60,809	0.16
1927	10,099	60,335	0.17
1929	10,885	67,994	0.16
1931	6,689	39,830	0.17
1933	4,940	30,557	0.16
1935	7,311	44,994	0.16
1937	10,113	60,713	0.17
1939	9,089	56,843	0.16

* Source: U.S. Census of Manufactures, as reported in "Statistical Abstract of the United States," p. 485, 1941

Wages as a Share of the Value of Total Product. The ratio of total wages (not including salaries) to total market value of production varies widely from industry to industry, but is surprisingly constant for manufacturing as a whole. This ratio for all manufacturing is shown in Table 12·8 by census years from 1899 to 1939; it is shown for selected industries for the year 1939 in Table 12·9.

This low figure of 16 to 17 per cent is sometimes used as a reason why management can afford to increase wage rates without making any appreciable increase in market prices. The argument is that because wages amount to only about one-sixth of the market value of the manufactured product, an average per cent increase in prices of only one-sixth of the per cent increase in wages would offset the increase in wages. Thus, if wage rates were increased 12 per cent, prices need be increased only 2 per cent.[17]

This argument is unsound because there is considerable duplication in the figures of total output of all manufacturing, although there is no duplication in the wage statistics. Processed materials and parts may be the product of one firm and figure in the total output. They may appear again in the completed product of another manufacturer. "Value of products" is in reality a hodgepodge of raw materials, semifinished parts, and service costs. Moreover, the cost of materials and services purchased by manufacturers is made up in large part of wages paid to wage earners in nonmanufacturing industries such as agriculture, mining, transportation, and other service industries. Finally, the census figures are for wages alone and do not include salaries.

Table 12·9. Relationship of Wages to Value of Product in Selected Industries for the Year 1939*

Industry	Wages as per cent of value of product
Railroads	46.6
Transportation	27.1
Machinery except electrical	23.0
Iron and steel	19.9
Electrical machinery	19.4
Automobiles and equipment	16.0
Paper and allied products	15.3
Nonferrous metals	11.6
Chemicals	9.5
Food and kindred products	8.6
Tobacco manufactures	5.2

* Source: U.S. Census of Manufactures, Vol. 2, Parts 1 and 2, Interstate Commerce Commission, Washington, 1939

But do not make the easy but erroneous inference that the wage rate is the only factor involved and that there is a simple, constant relationship between total wages and total value of production. What can be reasonably concluded is that several factors combine to bring about this remarkably close, but partly accidental, agreement. The value of production is increased when wage rates go up because of the effect of unit labor costs on market prices (which is discussed in a later section). Salary workers are not included in the total wage payments, and the ratio of wage workers to total workers has declined considerably over the years. But nevertheless, the over-all result is that wage workers have received approximately the same per cent of the value of the total product in good years and in bad over this long period. These figures increase the weight of statistical evidence in support of the basic principle that wages can be paid only out of total production, and that the most effective way to increase the total wage fund is to increase the total volume of production. The most effective way to increase annual earnings per worker is to increase total annual production per worker.

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[17] An example of this misuse of statistics may be found in the CIO *Economic Outlook* of December, 1946, and again in the March, 1947, issue.

Wages as a Share of Value Added by Manufacture. A more accurate and satisfactory measure of the part payroll costs play in manufacturing is the ratio of both wages and salaries to "value added by manufacture." Value added by manufacture is total market value less the cost of purchased materials, parts, and services. Thus, the duplications and other inconsistencies noted in the previous section are avoided. Table 12 · 10 shows this relationship for all manufacturing from 1899 to 1939.

Table 12 · 10. Relationship of Wages and Salaries to Value Added by Manufacture, 1899–1939*

Year	Value added, millions	Salaries and wages, millions	Per cent
1899	$4,647	$2,259	48.6
1904	6,019	2,991	49.7
1909	8,162	4,106	50.3
1914	9,238	4,931	53.4
1919	23,735	12,374	52.1
1921	17,253	9,870	57.2
1923	24,569	12,996	52.9
1925	25,668	12,732	49.6
1927	26,325	13,123	49.8
1929	30,591	14,284	46.7
1933	14,008	6,238	44.5
1935	18,553	9,565	51.6
1937	25,174	12,830	51.0
1939	24,683	11,630	47.1

* Source: U.S. Census of Manufactures, Vol. 1, p. 20, Interstate Commerce Commission, Washington, 1939

The true average ratio for manufacturing is seen to be around 50 per cent instead of 16 to 17 per cent. If the total labor force, including all industry and self-employed workers, is considered, then the ratio of total labor costs to total market value of the national product is between 70 and 80 per cent of market value. A wage increase that affects all of the labor force, and with other factors unchanged, causes nearly the same increase in over-all production costs. These ratios are important in evaluating the effects of general wage increases on the general price level.

Wage Rates in Various Countries. The figures given in Chap. 11 for productivity in different countries and for horsepower per worker in different countries can now be translated into corresponding figures for average hourly earnings of wage workers in different countries.

As should be anticipated, American workmen have earned and enjoyed the highest average level of real wages in the world because, among other reasons, the average American worker has at his command the largest capital investment and the largest block of mechanical power efficiently planned and directed.

Direct comparisons of wage rates of different countries are difficult to make because of the difficulty of comparing the real values of different national money units. A rough comparison can be made by determining for each country the number of units of some selected group of commodities (commonly used in all the countries being compared) that 1 hour of labor will exchange for, thus eliminating the difficulty of comparing different money units.

Table 12·11. Relative Wages in Selected Countries—1935

Country	Relative wages	Relative percentage
United States	3.80	100.0
Denmark	2.34	61.6
Switzerland	2.15	56.6
Holland	2.06	54.2
Norway	2.01	52.8
Great Britain	1.90	50.0
France	1.44	37.9
Germany	1.27	33.4
Belgium	1.22	32.1
Italy	0.96	25.3

The International Labor Office at Geneva, Switzerland, made a study of this kind in 1935. According to the results, 1 hour's work in the several countries would exchange for the number of units of goods shown in Table 12·11.

Unit Labor Costs. Now we come to one of the most significant practical relationships of manufacturing industry—the wage cost of a unit of product. It is the same relationship that is shown in a different form in Fig. 12·1. Up to this point we have been considering wages as income to the worker; now we will deal with the same figures as a cost of production. If unit labor cost of manufacturing industry or of a single branch of manufacturing or of a single firm is declining, it is then possible to reduce market prices or to increase wage rates without cutting into profits. It is a healthy condition for the nation, for an industry, or for the single firm. On the other hand, if unit labor cost is increasing, it is a signal that the price level is in danger.

Unit labor cost is equal to money wages per hour divided by physical production per man-hour. Consequently, unit labor cost can be reduced by reducing the average wage rate per hour, or by increasing production per man-hour.

Historically, in American industry low unit labor cost has been attained by increasing production per man-hour and not by reducing money wages.

Table 12·12. Unit Labor Costs—1903–1939
1939 = 100

Year	Output per man-hour	Actual earnings per hour	Unit labor cost
1903	35.6	29.1	81.7
1907	38.1	31.8	83.5
1909	38.1	31.1	81.6
1914	44.2	35.4	80.1
1919	43.8	73.8	168.5
1920	48.6	89.4	184.0
1921	52.7	76.8	145.7
1922	58.8	73.1	124.3
1923	57.3	80.4	140.3
1924	61.0	84.2	138.0
1925	65.1	84.0	129.0
1926	67.2	84.7	126.0
1927	69.3	85.3	123.1
1928	73.1	86.6	118.5
1929	75.5	87.5	115.9
1930	78.0	85.5	109.6
1931	81.5	79.9	98.0
1932	77.7	70.3	90.5
1933	82.9	69.4	83.7
1934	85.8	84.0	97.9
1935	90.9	86.9	95.6
1936	92.1	87.8	95.3
1937	90.9	98.4	108.3
1938	91.9	98.9	107.6
1939	100.0	100.0	100.0

The make-up of unit labor cost explains the paradox of high wages accompanied by low costs. Low unit labor cost attained by high production per man-hour, and in spite of high wages, is the major reason for the high plane of living in the United States.

Money wage rates are used for calculating unit labor cost (instead of real wage rates) because the manufacturer wishes to compare costs in terms of current dollar wage rates with market prices in terms of current dollars and for the same kind of goods to which the costs apply.

Unit labor costs for all manufacturing are shown in Table 12·12. Output per man-hour is taken from Table 12·3 and actual (money) wages per hour are taken from Table 12·1. Unit labor cost in the last column is the earnings per hour of the third column divided by output per man-hour of the second column.

Unit labor costs shown by Table 12·12 declined slightly from 1903 to 1914, then increased violently during the First World War with increasing wage rates and stationary production per man-hour. Unit labor costs declined from a war peak to a depression bottom from 1920 to 1933. Unit labor costs again increased from 1933–1939 and increased spectacularly during the Second World War and during the postwar years 1946–1948.

It will be shown in a later chapter, where the general price level is discussed, that unit labor cost is one of the major factors in determining the average price of manufactured goods. A declining unit labor cost means, at least, the possibility of declining wholesale prices of manufactured goods; a rising trend in unit labor cost is a sure promise of a rising trend in wholesale prices.

It is clear that it is unit labor cost and not the wage cost alone that is important from the standpoint of production costs and market price. Low unit cost is possible with a high wage rate, providing production per man-hour is also high. It is also plain that a rising trend in unit labor costs is not a threat to profits or the solvency of industry, providing the normal relationship between costs and market prices can be maintained.

High wage rates can be paid and earned if production per man-hour is correspondingly high. In the long run, wage rates can increase only as fast as production per man-hour is increased unless market prices go up. Money wages were less than 10 dollars a week from 1900 through 1905 and 54 dollars a week in September, 1948, for two reasons: in the earlier period market prices of manufactured goods were lower and productivity was lower. The fact that wages were 44 dollars a week lower in 1900–1905 does not represent "surplus value" of production that existed in the earlier period and stolen from "exploited" workers in the Marxian sense. The workers received just about the same per cent of the value added to the product in the early years of the century as they did during the 1930's (see Table 12·10).

Wage Rates, Production per Man-hour, and Unit Labor Cost since 1939. There are no such complete and authoritative studies of production per man-hour for manufacturing for the war and postwar years as the Fabricant studies for the period from 1899 to 1939. (This subject is discussed in Chap. 11.) One estimate made by the National Industrial Conference Board is that production per man-hour increased by 10 per cent over the 7-year period 1939–1946, or at an annual rate (compounded) of 1.5 per cent. If the increase in hourly wage rate of 72.5 per cent (from 63.3 cents in 1939 to $1.092 in 1946, given in Table 12 • 1) is combined with the estimated 10 per cent increase in production per man-hour, unit labor cost increased from 100 in 1939 to 157 in 1946.

Another estimate of unit labor costs since 1939, made by the economic staff of the Cleveland Trust Company, is shown by Fig. 12 • 3.[18] The industries included in this estimate are iron and steel, nonferrous metals, rubber, textiles, leather, manufactured food, tobacco, paper, printing and publishing, and petroleum and coal products. The editors call attention to the significance of this large increase in unit labor cost:

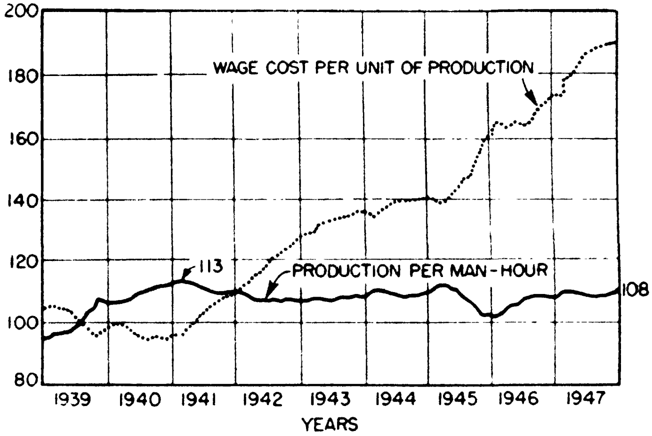

Fig. 12 • 3. Production per Man-hour and Unit Labor Cost since 1939
(1939 = 100)

Production per man-hour held approximately level from the end of 1941 to the end of 1947. Because wage rates per hour nearly doubled from 1939 to 1947, with an increase in production per man-hour of only 8 per cent, unit labor costs increased about 90 per cent, as shown by the dotted line.

> These high wage costs are important factors in lifting the prices at which goods are sold. Increased wage rates without corresponding increases in output per hour result in greater costs per unit of production. The wholesale prices of manufactured goods are now 78 per cent higher than they were in 1939. This rise corresponds to the 73 per cent increase in wage costs. The only way to lower prices will be to increase production without a corresponding increase in hourly pay.

Some Examples of Low Unit Labor Costs. National averages and industry averages of productivity and unit labor cost have value in that they disclose general economic conditions and relationships. But hidden within these national and industry averages are wide ranges of good and poor performances—of manufacturing success or failure—and cheering evidence of opportunities for improved performance in the future.

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[18] Published in the July 15, 1947, issue of the Cleveland Trust Company *Business Bulletin*, and republished Mar. 15, 1948, with 1947 figures added.

Among industries that can be highly mechanized are automobiles and electrical goods. Three examples from these industries will be cited to show what can be accomplished under favorable conditions with mass-produced, standardized products where mechanization is possible and where good management and good labor-management cooperation have realized the inherent possibilities.

Model T Ford. The Model T Ford is a well-publicized example of American mass-production industry and what it can accomplish by application of extreme standardization of product.

The Model T touring car was priced at $950 in 1909 when the standard wage rate in the Ford factories was 22.5 cents per hour (14 per cent above the national average) for a 60-hour work week. Weekly wages were $13.50.

In 1924 an improved Model T Ford was priced at $290, and the average wage rate was 83 cents an hour (55 per cent above the national average) with a 48-hour work week. Weekly wages were $39.84.

Market price was reduced 70 per cent for a better product while the hourly wage rate was increased 270 per cent during this period of 15 years.

Incandescent Lamps. The production per man-hour for the assembly of the familiar incandescent lamp in 1940 was 8.33 times the production per man-hour in 1924—16 years before. This assembly of filament, supporting wires, terminals and base with the bulb, and the treatment of the gas-filled bulb, is performed largely by automatic machines attended by women who need limited skill. In 1940 the average earned rate for this kind of work was 156 per cent of the 1924 rate. The unit labor cost in 1940, relative to 1924 (100 per cent), was 18.7 per cent.[19] This unit labor cost is based on direct labor cost only. Unit factory cost, including material cost, direct labor cost, and factory expense, was approximately 40 per cent of the 1924 cost. The 100-watt lamp sold at retail for 60 cents in 1924 and a better, higher efficiency lamp sold for 15 cents in 1940 or 25 per cent of the 1924 market price.

Welding Electrodes. In the electric arc-welding process the weld metal is used in the form of iron rods or electrodes, usually ⅜ inch in diameter. In the late 1920's it was discovered that a much better quality weld could be produced if the welding rod were coated with a claylike substance that would act as a flux and prevent oxidation of the molten metal. American practice is to coat the steel welding rod by an extrusion process, in which the total coating is applied at once under high pressure by means of a hydraulic press. The coating is then hardened by passing the freshly coated rods through an oven. European practice before the war was a much slower hand-dipping process.

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[19] $156 \div 833 = 0.187$.

The American process is largely automatic, and equipment has been developed over the years to handle the rods at higher and higher speeds in spite of the fragile nature of the unbaked coating. This coated welding rod was introduced and developed by the Lincoln Electric Company of Cleveland. The reduction in unit labor cost made by this company is developed in Table 12·13.

Table 12·13. Direct Labor Cost of Coated Welding Rod

Year	Hours direct labor per ton	Average wage rate per hour, *cents	Direct labor cost per ton, dollars	Unit labor cost
1929	70.0	$0.58	$40.60	1.00
1931	22.0	0.58	12.76	0.314
1939	4.2	0.76	3.19	0.078
1942	2.2	0.95	2.09	0.050

* Earned rate not including annual bonus based on total company profits. Actual average annual wage was $2,000 in 1921 $3,700 in 1937, $5,400 in 1942, and approximately the same high figure in 1943 through 1948.

The direct labor cost was reduced to a very small part of total cost, of which the major item is the steel rod material; the selling price was reduced from approximately 15 cents a pound in 1931 to less than 6 cents a pound in 1939.

These individual examples of manufacture under favorable conditions show many times the annual rate of increase of productivity and reduction in unit labor cost than that achieved by American manufacturing industry as a whole. These favorable examples indicate the possibilities of major gains when these same favorable conditions of good management, labor-management cooperation, incentive wage systems, and standardization of product can be extended more widely to more industries and products.

These three examples also show how the benefits of high productivity have been distributed in these specific cases: by increased hourly wages, by a shorter work week, and by lower prices.

With the Model T Ford, market price was reduced 70 per cent during 15 years; hourly wages were increased 270 per cent; the work week was reduced 20 per cent; the weekly wage was increased 197 per cent.

With the incandescent lamp, market price was reduced 75 per cent during 16 years; hourly wages were increased 56 per cent; the work week was reduced 20 per cent.

With the coated welding rod, market price was reduced about 60 per cent during 8 years; average hourly wages (excluding annual bonus) were increased 64 per cent over a span of 13 years.

Examples of Increasing Unit Labor Costs. The danger arising from a general increase in unit labor costs to the American standard of living through increased market prices has been pointed out. This potential danger has been realized in American industry generally since the Second World War and in a few American industries over a longer period. The bituminous and anthracite coal industries can be cited as significant examples.

Bituminous Coal. The bituminous coal industry has suffered for years from a declining market demand because of the competition of oil and gas and because of increasing economy in utilization of coal, and, more recently, from a strongly organized labor force able to enforce a high wage scale without regard to productivity. Because of a high wage scale and the cooperative policy of the United Mine Workers toward mechanization, the use of machinery to increase production per man-hour has accelerated, but the wage scale has increased much faster than the increase in productivity. Because of these conditions the demand for labor has declined since the First World War except for the respite provided by the Second World War.

Table 12·14. Unit Labor Costs—United States Bituminous Coal Production

	1937		1943	
	Amount	Per cent	Amount	Per cent
Coal produced, million tons	445.531	100	590.177	132.5
Average number of employees, thousands	491.864	100	416.007	84.5
Man-days worked, millions	95.016	100	109.709	115.6
Tons per man-day	4.69	100	5.38	114.7
Total payroll index, 1937=100	....	100	....	162.6
Payroll cost per man-day, 1937=100	....	100	....	140.7
Payroll cost per ton, 1937=100	....	100		122.7

Because hourly wage rates increased faster than production per man-hour, unit labor cost (per ton of coal) increased. To meet this condition, market prices were increased. Increased market prices with active competition from other fuels caused the market demand for coal to decrease still more, thus continuing the downward spiral of demand, production, and employment induced by an increased labor cost. The history of costs from 1937 to 1943, shown in Table 12·14, illustrates these adverse conditions.

Fewer miners worked in 1943 than in 1937, but worked more days. In 1937 the average miner worked 3.7 days per week spread over 52 weeks; in 1943 under the strong demand of wartime and with a smaller labor force, the work week was 5.2 days.

The record of productivity in American coal mining has been good, and, undoubtedly, improvement has been accelerated by high wage scales and increasing unit labor costs. Average production was 3½ tons per man-shift in 1910. In 1943 this output had risen to more than 5 tons per man-shift (as shown in the table). But this average industry figure is far below the output per man-shift in a few highly productive mines. Outputs as high as 20 tons per man-shift have been reached in properly engineered installations in which coal-cutting, loading, handling, and cleaning machinery are balanced, and where the mine layout can be planned for most economical operation.

According to the figures given in Table 12·14, productivity increased 14.7 per cent in 6 years, which is equivalent to 2¼ per cent compounded, which is not a bad record. But total payrolls increased 62.6 per cent, and the payroll cost per man-day increased 40.7 per cent, and the important payroll cost per ton increased 22.7 per cent.

In this predicament, brought on by increasing unit labor cost, the coal industry turned to the government for help. The Guffey Coal Act was passed by Congress to legalize industry-wide prices and guarantee coal prices. During the Second World War, the War Labor Board increased labor costs by establishing the practice of "portal-to-portal" pay, and OPA, in turn, authorized price increases to partially compensate the mine operators for the higher payroll costs. But higher wages and higher prices will not sell American coal or provide employment for American miners when the industry is again faced by more normal world supply and demand and other competitive conditions.

Anthracite Coal. Anthracite coal has developed even more serious unit labor cost problems. Ever since the end of the First World War this industry has been losing its market to lower cost or more convenient competitive fuels. Once the supremacy of anthracite coal as the ideal domestic and industrial fuel was unchallenged along the Eastern Seaboard. Production reached its all-time peak of nearly 100 million tons under war conditions in 1917; in 1921 it was down to 74 million; in the depression year of 1933 it was about 50 million; it was unable to recover with other industry and was only 46 million tons in 1938.

While the rest of the state and nation was recovering from the depression in the late 1930's, the anthracite region kept on going down. Mines were closing and mining settlements were becoming ghost towns. The fantastic bootleg mining industry grew up as idle miners returned to the coal properties, dug shafts, and set up dangerous, makeshift equipment to bring coal to the surface.

The established coal companies could not pay the union wage scale and sell coal at the competitive market price, but the miners were willing to work for whatever their manual labor would bring in the bootleg market. As the way out of an impossible situation, bootleg mining was legalized by the Commonwealth of Pennsylvania in 1941. The law requires the miner to pay a royalty to the owners of the coal lands, as do the mining companies, and regular coal producers are permitted by law to buy coal from the bootleg mines!

The Second World War provided the industry with a larger market, and gave it a breathing spell, but these more favorable conditions will pass with the abnormal market conditions. Then the high wage scale and high unit labor cost will again restrict the sale of anthracite in competition with oil and bituminous coal and reduce employment in the anthracite fields. This industry is a striking example of how a shortsighted wage policy can work against the true interests of labor, owners, and the general public. The anthracite coal industry is an essential industry, but it is a sick industry with declining employment, largely because of noncompetitive labor costs. This experience provides an interesting example of how fundamental principles operate to circumvent an economically unsound wage structure.

Technological Changes and the Wage Scale. An experience in the steel industry shows how a forced wage increase can temporarily increase unit labor costs and how the increase is corrected by greater productivity and reduced employment in the event of a stationary demand schedule.

In September, 1937, the Steel Workers Organizing Committee, later organized as the United Steelworkers of America, obtained a union contract with a large part of the steel industry and negotiated a substantial wage increase amounting to 26 per cent in wage rates and 14.5 million dollars in total industry monthly payroll. This increase was obtained at the very top of the business boom in 1937.

During the sharp business decline of late 1937 and early 1938, employment in the steel industry declined severely. By September, 1939, however, steel-ingot production had returned to the same volume as 2 years earlier, when the wage increase had been obtained, but employment had not returned to the September, 1937, level. Principally by the installation of labor-saving machinery (the continuous strip mill is an example) the same production was achieved in September, 1939, as had been produced in September, 1937, but with 30,000 fewer workers. In 1939 the total dollar payroll was approximately the same with fewer workers and a higher wage scale as it had been before the 1937 increase.

Philip Murray, then president of the SWOC, used these circumstances at a hearing of the Temporary National Economic Committee, to support the thesis that the 26 per cent wage increase had been nullified by the steel producers. It had, of course, been nullified by economic forces. Let Mr. Murray tell his own story:

> Briefly summarized, the period from August, 1936, to September, 1939, shows that the steel industry, through the installation of technological changes, had done the following:
>
> 1. Maintained the same labor cost of production ($12.50 of wages per ton of ingots produced), despite an increase of more than one-fourth in hourly wage rates;
> 2. Eliminated 14 million dollars from the total monthly pay envelopes of the steel workers from 1937 to 1939;
> 3. Raised production efficiency by one-fifth;
> 4. Displaced 30,000 steel workers;
> 5. Increased finished steel prices 9 per cent.
>
> In other words, the steel industry is able to produce the same amount of steel with 30,000 fewer workers. The steel workers who are currently employed are receiving more than 26 per cent higher wages per hour, but at the expense of 30,000 steel workers who have been displaced and are receiving no wages from the steel industry. . . . Through technological changes the steel industry has eliminated the effect of increased average hourly wage rates on the labor cost of steel production.[20]

The Conflict between Wage Policy and Price Policy. There are able students of industry who believe that problems of mass unemployment and idle factories would be solved if only manufacturers would reduce market prices generally and generously, and if the wage scale could be reduced correspondingly when necessary; in other words, to make prices and wages sufficiently fluid to meet changing demand; in short, to approach the conditions of an open market and perfect competition.

Competitive pressures and labor organizations set close limits on the wage and price policies an individual concern can pursue. Wage and price changes that are usually open to management decisions are limited to reducing prices below those of competitors or raising wages and salary scales above prevailing levels.

There is no question about the desirability of a low-price policy, particularly for those consumers' goods for which lower price may be expected to increase market demand (this subject was explored at length in Chap. 8). The practical difficulty that prevents many manufacturers from applying this desirable policy is that prices can be reduced only when an individual manufacturer is able to increase his production per man-hour faster than the corresponding community or industry wage scale is increasing. Substantially

[20] GOLDEN, CLINTON S., and HAROLD J. RUTTENBERG, "The Dynamics of Industrial Democracy," 7 ed., pp. 152–153, Harper & Brothers, New York, 1942.

the same wage scale must be met by all manufacturers within a given community or within the same industry. Only the manufacturer whose productivity is higher and whose unit labor cost is therefore lower than the average of his industry or the average of his community, can take the initiative in making price reductions that will stick.

Only the highly productive industries and the most efficient firms within an industry can afford this luxury of being economically wise in price policy. Only the more efficient producers can take the lead in reducing prices.

For most concerns the low-price policy runs head on into a much stronger high-wage policy. Consumers, labor unions, and government agencies are all strongly in favor of low market prices. So are manufacturers of goods whose markets can be enlarged by lower price. But over the past 40 years, and particularly since 1933, the high-wage policy has generally won out over a low-price policy. We can enjoy both only to the extent that increases in productivity permit.

Summary

There are a number of reasons why wages in actual labor markets do not follow the simple rules of static theory. The principle of supply and demand is effective only with unskilled labor and under extreme conditions of boom or depression. The principle of marginal cost does not apply at all in the dynamic economy of increasing returns. Labor is not fluid; it does not move readily from one locality to another or from one occupation to another. Land, labor, and capital cannot be applied independently of each other in the production process. Theory assumes that increments of labor or capital can be associated with specific increments of output, but in practical industry the labor cost of an increase in output is made up partly of existing fixed costs and partly of additional variable cost. Only the increase in unit variable cost affects marginal cost and can be associated with marginal product.

Labor markets, like commodity markets, differ in their degree of freedom. There is more active competition among unskilled workers than in the skilled trades or professions. Under modern conditions there is little competition among employers for labor except under extreme conditions of boom or depression.

The situation of self-employed farmers illustrates how wages in an open market (in this instance wages are the net income of the farmer) depend on the market value of production. The farmer's wage—his net income—depends on the market value of his crops.

Wage Rates and Employment. According to static principles there is at all times and under all conditions a "right" price for labor that will "clear the market." There is a continuous tendency for unemployment to disappear. Unemployment is looked upon as a symptom of the attempt by labor to secure a higher wage than the natural market rate. But in actual markets there are many other factors than the wage scale that determine the demand for labor. It is difficult to say that a higher wage scale would reduce employment or that a lower wage scale would increase employment in any specific situation.

Wage Scales in the United States. From colonial times wage scales in the United States have been relatively high—originally because opportunities for self-employment were more plentiful than workers—then because scarcity of labor encouraged the use of laborsaving machinery. Over the years, wage rates increased irregularly, but the trend was steadily upward. Before 1930 the level of wages was determined very largely by what employers were able and willing to pay, or by what workers were willing to take. Because of the social consequences of the Great Depression, the government took an active part in raising wage scales and from 1935 to 1938, especially, there was a succession of laws to encourage higher wage scales and to encourage unionization of workers.

National Wage Policy and Employment. Although it is impossible to be certain, it is a reasonable inference that the new policy of encouraging higher wage scales, without reference to the ability of workers to earn the higher rates or to their effect on production costs, was, in part, responsible for the long-continued mass unemployment from 1931 through 1940, and for mass unemployment during years of good business, such as 1936–1937 and 1939–1940.

Wage Statistics of the United States—Table 12·1 and Table 12·2. Money wages increased from $9 for a week of nearly 55 hours' work in 1900 to $53 for about 40 hours' work in 1948. Average hourly wages increased from 17 cents to $1.33, or more than eight times. Because prices also increased along with wages, real wages (in 1939 dollars) increased from $16.15 a week to $30.86 a week—a gain of 90 per cent.

For a longer period real hourly wages increased nearly 4.5 times from 1850 to 1940.

Wage Rates and Production per Man-Hour. Wage rates usually are high in industries having high production per man-hour and relatively low in industries of low productivity. More general statistics covering all manufacturing industries show a close correlation between real hourly earnings and output per man-hour (Fig. 12·1).

Wage Rates and Mechanical Power. Production per man-hour has increased approximately in step with mechanical power available per worker (Fig. 11·3). It is a logical deduction that wage rates are also proportional to the amount of power available to each worker (Fig. 12·2). An interesting deduction from this relationship is that the wage scale is dependent on investment of capital per worker. Therefore, a high rate of investment—for which high profits are necessary—is in the real interests of labor.

The Workers' Share of Production. Statistics of national production, compiled by the Department of Commerce, show that wages and salaries paid to individuals by private business bear a fairly constant ratio to the market value of total national product. This ratio varied from a minimum of 40.8 per cent in 1938 (omitting the abnormal war years of 1944 and 1945) to a maximum of 44.8 per cent in 1930. The ratio was 43.5, both in 1929 and 1946, and 43.4 per cent in 1947. This fairly constant ratio shows that the only way by which the workers' share of production can be greatly increased is by increasing total volume of production.

Wages and salaries separately also show this fixed relationship (see Table 12·6). *Industrial* wage payments also bear a fixed ratio to national income (Table 12·7). Wages of manufacturing industries are a fixed per cent of total product, but the ratio varies widely from industry to industry (Tables 12·8 and 12·9). Wages are also a fixed per cent of *value added* in manufacturing industries (Table 12·10).

Wages in Various Countries. Because of the relationships among investment per worker, mechanical power available per worker, and production per man-hour in various countries, it should be anticipated that wage rates in the United States are among the highest. This expectation is borne out by the record (Table 12·11). The purchasing power of wages in the United States is double that of wages in Britain, three times that of Germany (1935), and four times that of Italy.

Unit Labor Costs. The unit labor cost in manufacturing is equal to money wages per hour divided by production per man-hour. It is unit labor cost and not wage cost alone that is important from the standpoint of production costs and market prices. High productivity makes it possible to reduce market prices and increase wages at the same time.

Unit labor costs increased during the two world wars, but were reduced from an index of 184 in 1920 (1939 = 100) to an index of 83.7 in 1933 (see Table 12·12) and to 157 in 1946, with further increases in 1947 and 1948.

Declining unit labor cost is a favorable condition because it means that market prices can be reduced without reducing wage rates or wage rates can be increased without increasing market prices.

Industries with declining unit labor costs, such as steel, electrical equipment, and automobiles, are prosperous industries that can pay high wages, earn high profits, and maintain low market prices. Industries with increasing unit labor costs, like bituminous and anthracite coal, face difficulty in meeting wage demands and remaining solvent, and in meeting the competition of substitute products. A general upward trend in unit labor costs leads inevitably to an upward trend in the market prices of manufactured products.

Review Questions

1. *a.* In what major ways do markets for labor differ from markets for commodities under conditions of perfect competition?
   b. Under actual conditions?

2. At the beginning of the 1929–1932 depression, the Hoover Administration urged employers to maintain wage rates at prosperity levels in order to maintain purchasing power. Do you think this action helped or hindered the decline in employment and purchasing power? Give your reasons.

3. Under the conditions of the nationalized British coal industry, what factors do you think will be most powerful in determining "wages and hours" of the industry?

4. Why do you think average wage rates in the United States are about double those of other industrialized nations?

5. If an automobile assembly plant moved into a general farming community, static theory would lead one to expect that competition for labor would equalize wage rates for local hired farm workers and for hired workers in the automobile plant. Assume that the hired farm worker is at least as intelligent and skilled and requires at least as much training as the assembly-line worker in the automobile plant.
   a. What do you think would actually happen to the supply of farm labor and to wage rates for each kind of work?
   b. What principle is important in determining the wage level in both of these industries, assuming a relatively free, dynamic labor market without labor-union or employer-monopoly labor agreements?

6. In 1914 average real hourly earnings in manufacturing were about 31 cents an hour. Fifteen years later—in 1929—the corresponding wage rate was 45 cents. If output per man-hour in 1929 was 75.5 (1939 = 100), what would be a reasonable estimate of output per man-hour in 1914 (1939 = 100)?

7. If production per man-hour in manufacturing in 1960 is assumed to be 170 per cent of 1939 production per man hour, what would you expect to happen to the corresponding real wages and to real profits (*i.e.*, profits and wages measured in 1939 dollars) by 1960?

8. *a.* If it is assumed that the horsepower of electric motors (and other sources of factory power) per wage earner in manufacturing increased 50 per cent by 1960, is this assumption consistent with the assumptions of question 7?
   b. Based on the assumption of 8*a*, what may be expected to happen to production per man-hour and to wages by 1960?

9. Do you consider that employees of the United States are getting the "short end of the stick" in the distribution of the market value of gross national production?

10. Department of Commerce statistics show that the ratio of wages to the market value of products in manufacturing is about 16 per cent. Based on this figure, labor economists have claimed that manufacturers could grant a general 20 per cent increase in wages applying to all manufacturing and balance the cost of the wage increase by an average increase in the prices of manufactured products of 3 to 4 per cent.
    - *a.* What would happen to manufacturers' costs, revenue, and profits if all manufacturers followed the program?
    - *b.* If only one manufacturer followed the program, the others making no change in wages or prices?

11. *a.* How do you explain the apparent paradox of dollar wage rates and profits being increased and dollar prices being reduced all during the same period?
    - *b.* How is it possible for a manufacturer to increase average wages and salaries without increasing average prices of his product?

PART FOUR. The Dynamic System; The Conditions for Stability

13. NATIONAL INCOME AND PRODUCT

Before taking up the study of the behavior of the aggregate economy, it will be desirable to explain in some detail the statistical measures of national income and national product. We should have a fairly definite mental picture of the size of these aggregate measures of economic activity and how they have fluctuated over the years. In short, what is the size of national production and how stable or unstable has it been? It has grown vastly, but spasmodically; there has been gratifying progress, but, at times, alarming, disastrous instability.

A long-range picture of the growth of American industry was presented in Chap. 2. In this chapter we will take a closer look at national income statistics over the past 20 years, see how the figures are obtained and what they signify. We will then see how the national income is distributed to the various classes of income receivers and how it originates. For these purposes we will use the system of national accounts set up by the Department of Commerce.

It is difficult—it may be impossible—to make a complex system of accounts easily understood. One who is not a trained accountant, and has tried to understand a corporation accounting manual, will agree with this understatement of the situation. And the accounting problems of even the largest private corporation are simple compared with those encountered in a system of accounts designed to cover the entire national economy.

Despite the difficulties, it is desirable to make the effort to understand the structure and the composition of the national accounting system whose product is the set of annual statistics we know as national income and national product. These annual figures have become familiar supports of economic discussions ranging from the President's economic budget, the ability to pay higher wages, to an explanation of the cost of living. Without some degree of understanding of the national accounting system, it is difficult to understand the way the aggregate economy operates or to understand current discussions of economic problems.

To begin at the beginning, how are the original figures collected for a national income and product statement? For the accounting statements of a private business there is a written document for every penny of cash receipts and every penny of expenditure, and supporting documents for every entry that is not a cash transaction. There is no such collection of original records to serve the needs of the statisticians who keep the books for the national economy. They must find the figures wherever they can, and where reliable figures are not available, they must make the best guesses that are possible.

Where do the figures for these accounting statements come from? They come from many government and private statistical agencies, and, in many instances, the same item comes from several different sources, one checking the others. The total national income is built up in two ways: from the income side and from the product side, and the two sides of the accounts are made to agree exactly by arbitrary adjusting items. The voluminous statistics of the Bureau of the Census, the income-tax figures of the Treasury, the farm statistics of the Department of Agriculture, wage and salary statistics of the Department of Labor are all used in compiling national income. The data on wages and employment, collected by the Social Security Administration, have made possible a new standard of accuracy in estimating payroll costs and income. Certain final figures are prepared by agencies best qualified to deal with the specific matters: farm income by the Bureau of Agricultural Economics; estimates of individual savings by the Securities and Exchange Commission; new construction and balance of international payments by the appropriate government agencies.

Different parts of the national income statistics vary considerably in accuracy. Fortunately, the largest item—wages and salaries—is one of the most accurate. The most important item of low accuracy is the income of unincorporated enterprises, exclusive of farm income. For only a small part of retail trade, and of similarly self-employed persons, is income known through income-tax returns. Rough estimates are necessary for a number of other kinds of income, but, fortunately, these items are small.

The Concept of National Income and National Product. The First World War had shown the need for a more comprehensive and accurate picture of over-all national economic activity, and the statistics of national income were the answer. The Second World War disclosed new requirements which brought out the more complete system of national accounting that we now have.

The earliest national income statistics were devised to show receipts and expenditures of individuals. These figures showed the different kinds of income: wages and salaries, dividends, rent, and so on, but they did not tell directly the sources of the income by kind of business or government activity. National income figures also did not include those costs of production that were not paid out to individuals as income. Large items of this kind are the depreciation of capital assets of all kinds, corporate-retained profits, and the taxes paid by corporate enterprises.

The immense production requirements of the Second World War raised new questions as to the capacity of American production facilities to provide both civilian goods and military goods in the desired quantities. It was necessary to study the American economy from this standpoint of production capacity based on market prices. The concept of national product statistics was the answer, and the development of a complete national budget became desirable.

National product represents the total market value in current dollars of the total national production of goods and services in a given time.

National income is less than national product by the amount of business taxes and capital consumption allowances; *i.e.*, depreciation allowances. National income represents the total payments out of current production to individuals as consumers and corporate profits. National income is also equivalent to the national product "at factor costs" instead of "at market value," which is national product.[1]

It will be helpful in understanding the national accounts if it is realized that the same figures are arranged in two different ways to secure total national income and national product. The national income can be compiled either: (1) by adding the factor incomes *paid out* (or retained) by the sectors of the economy; or (2) by adding the factor incomes *received* (or retained) by them.

In a similar manner, the gross national product can be obtained by summing either the gross product originating in the various sectors or the purchases or output by the various sectors.[2]

The gross national product can be built up by expenditures of the four sectors into which the national economy is divided or by the market value of the products and services originating in the four sectors. Tables 13 · 7 and 13 · 8 illustrate some of these ways of building up national income and national product.

The Purposes and Structure of National Product and Income Statistics. The system of national accounts established by the Department of Commerce is designed to provide a measure in current dollars of the aggregate market value of all goods and services produced by the nation during a given accounting period, such as a year, and of the national income received by individuals and by business as a result of this production; to show where the national product and income originate in amount and kind and how it is distributed.

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[1] Factor costs are defined as payments made for the use of the factors of production: labor and property, such as payroll costs, interest, rent, and profits—all before taxes.

[2] National Income Supplement to *Survey of Current Business*, pp. 6–7, U.S. Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, July, 1947.

In order to carry out these purposes, five different accounts or aggregates are set up. These are: (1) national income; (2) gross national product; (3) net national product; (4) personal income; and (5) disposable personal income.

To show the sources of national product and income, the national economy is divided into four sectors: (1) the business sector; (2) the government sector (including Federal, state, and local governments); (3) the personal or individual sector; and (4) the foreign sector.

For each of these sectors a debit and credit account is set up. For the business sector this account is a complete income and product account (profit-and-loss account), but for the other three sectors the account necessarily is a current cash account of receipts and expenditures.

It would be useful if a complete statement of capital assets and liabilities of the nation were included in the system of national accounts. A balance sheet of this kind is not as yet available, but the need is recognized and steps are being taken to develop it. In the meantime, a single-year statement of changes in all capital items is provided. This statement shows changes in the relevant items of assets, liabilities, and surplus arising out of the current year's operations to the extent that such items are segregated in the national accounts.

The Four Sectors of the Economy. The *business sector* of the economy covers all the firms, organizations, and institutions which produce goods or services for sale at prices intended to approximate costs of production. The business sector is intended to cover all private enterprises organized for profit, both corporate and unincorporated, including farmers, storekeepers, professional practitioners, and lessors of real property. Mutual financial organizations, cooperatives, nonprofit organizations (trade associations) serving business, and owner-occupied houses are included in the business sector (because imputed rent of owner-occupied houses is included as income and as a cost in the business-sector statement). *Government enterprises,* such as the post office and electric-power systems, whose primary income arises from charges to customers for their services, are also included, but only with respect to their purchases and sales on current account. Purchases of government enterprises on capital account and their net interest payments and operating surplus or deficit are included in the accounts of the government sector.

The *government sector* includes the expenditures and receipts of all Federal, state, and local government operations except the current purchases and sales of government enterprises as just described. Expenditures include payroll costs of government employees, purchases of goods from business, net interest paid, and the so-called transfer payments. Transfer payments are income payments to individuals for which no services are rendered in return.

The *personal sector* includes income-producing activities of households and private nonprofit institutions serving individuals, private trust funds, and pension and welfare funds. The principal function of the personal statement of receipts and expenditures, however, is to provide a place for total income receipts of all individuals from the three other sectors and for total expenditures and savings to balance the account. For this purpose the personal sector includes all individuals in their dual debit and credit capacities of receivers of income, buyers of consumption goods and services, and savers.

The *foreign sector* includes the income of residents of continental United States received from places outside continental United States. This statement is also used to exclude the earnings of foreigners paid by domestic establish-

Table 13·1. National Income and Product Account, 1939*
Millions of Dollars

Compensation of employees:		Personal consumption expenditures	$67,466
Wages and salaries	$45,745	Gross private domestic investment	9,004
Supplements	2,075	Net foreign investment	888
Income of unincorporated enterprises and inventory valuation adjustment	11,282	Government purchases of goods and services	13,068
Rental income of persons	3,465		
Corporate profits and inventory valuation adjustment:			
Corporate profits before tax:			
Corporate profits tax liability	1,462		
Corporate profits after tax:			
Dividends	3,796		
Undistributed profits	1,209		
Inventory valuation adjustment	-714		
Net interest	4,212		
National income	72,532		
Indirect business tax and nontax liability	9,365		
Business transfer payments	451		
Statistical discrepancy	462		
Less: Subsidies minus current surplus of government enterprises	485		
Charges against net national product	82,325		
Capital consumption allowances	8,101		
Cost and profit charges against gross national product	$90,426	Expenditures for gross national product	$90,426

* Source: National Income Supplement to *Survey of Current Business*, Table I, p. 2, U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, July, 1947.

ments. Inasmuch as national product is measured in terms of purchases of goods and services, the purchases of United States production by foreigners (exports) must be added to domestic purchases to obtain total production, and purchases of foreign goods and services by domestic producers and consumers (imports) must be subtracted.

Table 13·2. Consolidated Business Income and Product Account, 1939*
Millions of Dollars

Compensation of employees:		Consolidated net sales:	
Wages and salaries:		To consumers	$63,816
Disbursements	$36,250	To government	5,375
Excess of accruals over disbursements	0	To business on capital account	8,563
Supplements:		To abroad	1,123
Employer contributions for social insurance	1,330	Change in inventories	441
Other labor income	431		
Income of unincorporated enterprises and inventory valuation adjustment	11,282		
Rental income of persons	3,465		
Corporate profits before tax and inventory valuation adjustment:			
Corporate profits before tax:			
Corporate profits tax liability	1,462		
Corporate profits after tax:			
Dividends	3,659		
Undistributed profits	1,162		
Inventory valuation adjustment	-714		
Net interest	3,284		
Income originating	61,611		
Indirect business tax and nontax liability	9,365		
Business transfer payments	451		
Statistical discrepancy	462		
Less: Subsidies minus current surplus of government enterprises	485		
Charges against net product	71,404		
Capital consumption allowances	7,914		
Cost and profit charges against business gross product	$79,318	Business gross product, consolidated net sales	$79,318

* Source: National Income Supplement to *Survey of Current Business*, Table II, p. 3, U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, July, 1947.

The form of accounts that are set up for the four sectors and for the capital items arising out of the current income statements is shown by Tables 13 · 1 to 13 · 6, inclusive.[3]

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[3] These tables and other material relating to national income accounting are taken from National Income Supplement to *Survey of Current Business* July, 1947.

The Five Classifications of National Product and Income. The basic accounts of the business, government, personal, and foreign sectors, and of capital transactions of Tables 13·1 to 13·6 provide the figures for the five major accounts or aggregates of national income statistics previously listed.

Table 13·3. Consolidated Government Receipts and Expenditures Account, 1939*
Millions of Dollars

Purchases of goods and services:		Personal tax and nontax receipts	$ 2,440
Purchases of direct services:		Corporate profits tax accruals	1,462
Compensation of employees:		Indirect business tax and nontax accruals	9,365
Wages and salaries	$7,343	Contributions for social insurance:	
Supplements:		Employee contributions	596
Employer contributions for social insurance	199	Employer contributions:	
Other labor income	87	Business	1,330
Income originating and net and gross product	7,629	Government	199
Net purchases from business	5,375	Household and institutions	11
Net purchases from abroad	64	Deficit (plus) or surplus (minus) on income and product transactions	1,867
Transfer payments	2,512		
Net interest paid	1,205		
Subsidies minus current surplus of government enterprises	485		
Government Expenditures	$17,270	Government Receipts and Deficit	$17,270

* Source: National Income Supplement to *Survey of Current Business*, Table III, p 4, U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, July, 1947

Table 13·4. Rest of the World Account, 1939*
Millions of Dollars

Net payments of factor income to the U.S.:		Net disinvestment in U.S.	$888
Wages and salaries	$ 2		
Interest	127		
Dividends	137		
Branch profits	47		
Income originating and net and gross product	313		
Net purchases from the U.S.:			
From business	1,123		
From government	–64		
From persons	–484		
Net current payments to the U.S.	$888	Net disinvestment in U.S.	$888

* Source: National Income Supplement to *Survey of Current Business*, Table IV, p. 4, U. S. Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, July, 1947.

National income is the basic aggregate. It is the total earnings from personal services and property which arise from the current production of goods and services. Earnings consist of the compensation of employees (wages,